Biological Evaluation

of the NPDES Permit No. WA-0001902

For Discharges from

Leavenworth National Fish Hatchery
Leavenworth, Washington

Prepared For:

U.S. Fish and Wildlife Service

and

National Oceanic and Atmospheric Administration - Fisheries

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LIST OF ACRONYMS

ACOE	U.S. Army Corps of Engineers
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
CAAP	Concentrated Aquatic Animal Production
CFR	Code of Federal Regulations
CR	Columbia River
CWA	Clean Water Act
DO	dissolved oxygen
DPS	Distinct Population Segments
Ecology	Washington Department of Ecology
ESA	Endangered Species Act
ESU	Evolutionarily Significant Units
FPC	Fish Passage Center
FR	Federal Register
gpd	Gallons Per Day
IHNV	Infectious Hematopoietic Necrosis Virus
INAD	Investigational New Animal Drug
K_{ow}	Octanol-water partitioning coefficient, a measure of how lipophilic a chemical is
K_{oc}	Organic carbon adsorption coefficient, an estimate for a chemical's mobility into soil and prevalence of leaching from soil.
LAA	likely to adversely affect
LC_{50}	the amount of a substance needed to kill half of a group of experimental organisms in a given time; a standard measure of toxicity.
LNFH	Leavenworth National Fish Hatchery
mg/L	milligrams per liter
NE	no effect
NLAA	not likely to adversely affect
NMFS	National Marine Fisheries Service
NOAA Fisheries	National Oceanic and Atmospheric Administration Fisheries
NOEC	No observable effect concentration
NPDES	National Pollutant Discharge Elimination System
PEC	predicted environmental concentration
R10	EPA Region 10
Rkm	River Kilometer
TMDL	Total Maximum Daily Load
UCR	Upper Columbia River
µg/L	Micrograms per liter
USEPA	U.S. Environmental Protection Agency
USFDA	U.S. Food and Drug Administration
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WQBEL	water quality based effluent limitation

Chapter 1 BACKGROUND/HISTORY

The proposed Federal action that is the subject of consultation under Section 7 of the Endangered Species Act (ESA) between the U.S. Environmental Protection Agency (USEPA) and the National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) (collectively referred to as the Services) is the issuance of a National Pollutant Discharge Elimination System (NPDES) permit for wastewater discharges from Leavenworth National Fish Hatchery (LNFH), Leavenworth, Washington. This permit is an NPDES permit that will be issued pursuant to the Clean Water Act (CWA). When issued, the proposed permit will establish effluent limitations, prohibitions, best management practices (BMPs), and other conditions governing the discharge of pollutants to waters of the United States from this fish hatchery.

The fact sheet developed in support of the proposed permit describes the proposed permit requirements as well as the scope of the permit. Copies of the permit and fact sheet are included in Appendices A and B, respectively.

This biological evaluation (BE) discusses and assesses potential impacts to listed species due to discharges from LNFH. Much of the information in this BE was previously included in the BE for the NPDES General Permit No.: WAG-13-0000 for Fish Hatcheries located on Tribal and Federal Land in the State of Washington (USEPA 2009a)

Chapter 2 DESCRIPTION OF THE ACTION AND ACTION AREA

EPA proposes to issue a National Pollutant Discharge Elimination System (NPDES) permit (GP) to establish conditions for the discharge of pollutants in wastewaters from Leavenworth National Fish Hatchery (LNFH).

At 40 CFR §122.24, EPA defines a concentrated aquatic animal production (CAAP) facility as a point source subject to the NPDES permit program and further defines such a facility as a hatchery, fish farm, or other facility that contains, grows, or holds:

1. Cold water fish species or other cold water aquatic animals in ponds, raceways, or other similar structures, which discharge at least thirty days per year, but does not include:

    a. Facilities that produce less than 9,000 kilograms harvest weight (approximately 20,000 pounds) of aquatic animals per year, and
    b. Facilities that feed less than 2,272 kilograms (approximately 5,000 pounds) of food during the calendar month of maximum feeding.

2. Warm water fish species or other warm water aquatic animals in ponds, raceways, or other similar structures, which discharge at least thirty days per year, but does not include:

    a. Closed ponds that discharge only during periods of excess runoff, or
    b. Facilities that produce less than 100,000 pounds of aquatic animals per year.

Cold water aquatic animals include, but are not limited to, the Salmonidae family of fish, such as trout and salmon; and warm water aquatic animals include, but are not limited to, catfish, sunfish, and minnows.

LNFH produces approximately 150,000 pounds per year of spring Chinook and coho salmon; it feeds approximately 21,700 pounds of food in its month of maximum feeding. Therefore, it is a confined aquatic animal production facility.

The permit will expire five years after its effective date, as specified on the cover page of the permit. In accordance with 40 CFR §122.6, if the permit is not reissued by its expiration date, the conditions of the permit will continue in force and effect until a new permit is issued only if the permittee submits a permit application at least 180 days prior to the expiration date of the permit.

The action area for this biological evaluation is Icicle Creek and the Wenatchee River.

2.1 EFFLUENT LIMITATIONS AND PROHIBITIONS

Sections 101, 301, 304, 308, 401, 402, and 403 of the CWA provide the basis for effluent limitations and other conditions in the permit. The USEPA has evaluated possible discharges from LNFH with respect to these sections of the CWA and relevant NPDES implementing regulations to determine what conditions and requirements to include in the permit.

In general, the CWA requires effluent limits that are the more stringent of either technology-based or water quality-based limitations. Technology-based effluent limits are based on a minimum level of treatment for point sources provided by currently available treatment technologies. Water quality-based effluent limits (WQBELs) are developed to ensure that applicable water quality standards for receiving waters are met. The effluent limitations for the permit are presented below.

2.1.1 Effluent Limitations

2.1.1.1 Notification Requirements

LNFH will be required to provide written notification to the USEPA of the use of an Investigational New Animal Drug (INAD) or an extra-label drug use where such use may lead to a discharge of the drug to waters of the United States. Oral notification needs to be provided to the USEPA, preferably before, but no later than seven days after initiating use of the drug and shall identify the drug used, method of application, and reason for using that drug; a written report is due within 30 days of initiating use.

LNFH is required to provide written notification to the USEPA of failure in, or damage to, the structure of a fish hatchery containment system resulting in an unanticipated material discharge of pollutants to waters of the United States (WUS). Oral notification needs to be provided to the USEPA within 24 hours after discovery of the failure or damage and a written report is due within five days; it must identify the cause of failure or damage in the containment system, identify the materials that have been released to the environment as a result to this failure, and steps taken to prevent a reoccurrence.

In the event of a spill of drugs or pesticides that results in a discharge to waters of the United States, the permittee is required to provide an oral report of the incident to the USEPA within 24 hours of its occurrence, identifying the material and quantity spilled; a written report is due within 5 days. The permittee must also report any spills of oil or hazardous materials to the Washington Department of Ecology.

2.1.1.2 Discharge Requirements

LNFH may discharge from the outfall(s) to Icicle Creek within the limits and subject to the conditions set forth in the permit:

a. LNFH must comply with the Best Management Practices Plan required in Section III.E of the permit (Appendix A).

b. Discharges from LNFH must not exceed the effluent limitations set forth in the permit. In accordance with the Washington State Department of Ecology's §401 Clean Water Act certification, a five year compliance schedule is included in the permit for the facility to come into compliance with the final phosphorus limits. These effluent limitations are summarized in Tables 2-1 through 2-3.

Table 2-1: Discharge Limitations for Rearing Ponds and Raceways except during Drawdown for Fish Release			
Parameter	**Monthly Average**	**Daily Maximum**	**Instantaneous Maximum**
Settleable Solids (SS)	0.1 mL/L	--	--
Total Suspended Solids (TSS)	5.0 mg/L (net)[1]	--	15.0 mg/L (net)
	622 kg/day (net)	921(gross)[2]	--
Temperature	--	16° C[3]	--
Total Residual Chlorine	0.009 mg/L	--	0.018 mg/L[4]
	1.1 kg/day	--	2.2 kg/day
Total Phosphorus	0.02 mg/L (interim limit)[5]	0.04 mg/L (interim limit)[5]	--
	2.5 kg/day (interim limit)[5]	4.7 kg/day (interim limit)[5]	--
	--	0.52 kg/day[6] (final limit)	--
	--	5.7 μg/L[6] (final limit)	--

[1] The monthly average and the instantaneous maximum limits for TSS are net limits; influent concentrations may be subtracted from the gross measurement when determining compliance.

[2] The daily maximum TSS mass limit is a gross limit; influent concentrations may not be deducted from it.

[3] The limit is on the 7-day average of daily maximum temperatures.

[4] The permittee must report to EPA and Ecology within 24 hours of an instantaneous maximum limit violation for total residual chlorine. See Part V.G.

[5] The interim total phosphorus limits apply during the critical periods of March 1 through May 31 and July 1 through October 31 until the facility is able to comply with the final limits, but no later than the final compliance date of *[insert final compliance date]*.

[6] The final limits for total phosphorus are daily maximum limits that apply to the **total combined hatchery discharge from the raceways, adult ponds, and pollution abatement ponds** during the critical periods of March 1 through May 31 and July 1 through October 31 as soon as the facility is able to comply with the final limits, but no later than the final compliance date of *[insert final compliance date]*.

Table 2-2: Discharge Limitations for Pollution Abatement Ponds			
Parameter	**Monthly Average**	**Daily Maximum**	**Instantaneous Maximum**
Settleable Solids	--	--	1.0 mL/L
Total Suspended Solids	--	--	100 mg/L
	--	--	3274.6 kg/day
Temperature	--	--	16° C [7]
Total Phosphorus	0.10 mg/L (interim limit)[8]	0.16 mg/L (interim limit)[8]	--
	3.3 kg/day (interim limit)[8]	5.2 kg/day (interim limit)[8]	--
	--	0.52 kg/day (final limit)[9]	--
	--	5.7 µg/L (final limit)[9]	--

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7 The limit is on the 7-day average of daily maximum temperatures.

8 The interim total phosphorus limits apply during the critical periods of March 1 through May 31 and July 1 through October 31 until the facility is able to comply with the final limits, but no later than the final compliance date of *[insert final compliance date]*.

9 The final limits for total phosphorus are daily maximum limits that apply to the **total combined hatchery discharge from the raceways, adult ponds, and pollution abatement ponds** during the critical periods of March 1 through May 31 and July 1 through October 31 as soon as the facility is able to comply with the final limits, but no later than the final compliance date of *[insert final compliance date]*.

Table 2-3: Discharge Limitations for Raceways and Adult Ponds during Drawdown for Fish Release			
Parameter	**Monthly Average**	**Daily Maximum**	**Instantaneous Maximum**
Settleable Solids	--	--	1.0 mL/L
Total Suspended Solids	--	--	100 mg/L
	--	--	12,431.2 kg/day
Temperature	--	--	16° C[10]
Total Phosphorus	0.02 mg/L (interim limit)[11]	0.04 mg/L (interim limit)[11]	--
	2.5 kg/day (interim limit)[11]	4.7 kg/day (interim limit)[11]	--
	--	0.52 kg/day (final limit)[12]	--
	--	5.7 µg/L (final limit)[12]	--

[10] The limit is on the 7-day average of daily maximum temperatures.

[11] The interim total phosphorus limits apply during the critical periods of March 1 through May 31 and July 1 through October 31 until the facility is able to comply with the final limits, but no later than the final compliance date of *[insert final compliance date]*

[12] The final limits for total phosphorus are daily maximum limits that apply to **the total combined hatchery discharge from the raceways, adult ponds, and pollution abatement pond**s during the critical periods of March 1 through May 31 and July 1 through October 31 as soon as the facility is able to comply with the final limits, but no later than the final compliance date of *[insert final compliance date]*.

2.2 MONITORING AND REPORTING REQUIREMENTS

Discharges authorized by the permit from fish hatcheries are required to be monitored at each outfall described by the NOI. Monitoring will be performed before effluent contacts the receiving water as detailed in Tables 2-4 through 2-6.

Table 2-4: Monitoring Requirements for Discharges from Raceways and Adult Ponds

Parameter	Sample Location	Sampling Frequency	Type of Samples
Flow (MGD)	I & E[13]	hourly	Meter or other approved method[14]
Settleable Solids (ml/L)	E	2/month	Grab[15]
Total Suspended Solids (mg/L)	I[16] & E	monthly	Grab[15] & Composite[17]
Total Phosphorus (mg/L)	E	2/month (3/1—5/31, 7/1—10/31)	Composite[17]
Temperature (° C)	I & E	hourly	Meter
Total Residual Chlorine or other disinfectants (mg/L)	E	Daily during periods of disinfectant use	Grab

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13 "I" = Hatchery or rearing facility influent; E = Hatchery effluent prior to mixing with the receiving waters or any other flow.

14 Appropriate flow measurement devices and methods consistent with accepted aquaculture practice must be selected and used to ensure the accuracy and reliability of measurements of the quantity of monitored flows.

15 Effluent sample must be taken during rearing pond or raceway cleaning. If the frequency of rearing pond or raceway cleaning is less than the sampling frequency, the sample may be collected immediately following fish feeding.

16 For reporting net values, the permittee must take both influent and effluent samples on the same day and report both results on the DMR form. The collection of this measurement for solids analysis is optional if the Permittee chooses to represent the influent measurement as zero concentration. EPA may require further characterization of the influent and effluent solids to demonstrate comparability.

17 The composite sample must be a combination of at least six representative grab samples collected throughout the normal working day. At least one sample must be collected while the fish are being fed and another during rearing pond or raceway cleaning. Equal volumes of each of six or more grab samples must be combined to constitute the total composite sample.

Table 2-5: Monitoring Requirements Discharge from the Pollution Abatement Ponds			
Parameter	**Sample Location**	**Sampling Frequency[18]**	**Type of Samples[19]**
Flow (GPD)	EW[20]	hourly[21]	Meter or other approved method[22]
Settleable Solids (ml/L)	EW	1/month[21]	Grab
Total Suspended Solids (mg/L)	IW[23] & EW	1/month[21]	Grab
Total Phosphorus (mg/L)	EW	2/month[21] (3/1—5/31 and 7/1—10/31)	Grab
Temperature (° C)	EW	Hourly	Meter
Ammonia (mg/L)	EW	quarterly[24]	Grab
pH (s.u.)[25]	EW	quarterly[24]	Grab

[18] Pollution abatement pond discharges must be monitored for all parameters except total phosphorus 12 months out of the year if there is a discharge, regardless of pounds of fish present; total phosphorus must be monitored in the months specified.

[19] Pollution abatement pond effluent samples must be collected during the last quarter of a rearing pond or raceway cleaning event.

[20] "EW" means pollution abatement pond effluent sample taken prior to mixing with any other hatchery or rearing flows or receiving waters.

[21] If the pollution abatement pond discharges less frequently than the required sampling frequency, the testing frequency must be the pollution abatement pond discharge frequency. Testing of the pollution abatement pond discharge is unnecessary if the pond does not discharge during a reporting period. "No Discharge" must be noted in the comments section on the DMR form.

[22] Appropriate flow measurements devices and methods consistent with accepted aquaculture practice must be selected and used to ensure the accuracy and reliability of measurements of the quantity of monitored flows.

[23] "IW" means pollutions abatement pond influent. The collection of this measurement for TSS analysis is optional if the Permittee chooses to represent the influent measurement as zero concentration. Influent and effluent solids must be characteristically similar to use net calculations.

[24] Quarterly monitoring must begin in the first full calendar quarter of permit coverage.

[25] pH monitoring must be taken concurrently with the grab sample for the ammonia sample.

Table 2-6: Monitoring Requirements for Discharges from Raceways and Adult Ponds during Drawdowns for Fish Release			
Parameter	**Sample Location**	**Sampling Frequency[26]**	**Type of Samples[27]**
Flow (gpd)	E	Hourly	meter[28]
Settleable Solids (ml/L)	E[29]	1/drawdown	Grab
Total Suspended Solids (mg/L)	E	1/drawdown	Grab
Total Phosphorus (mg/L)	E	1/drawdown (3/1—5/31 and 7/1—10/31)	Grab
Temperature (° C)	E	Hourly	meter

[26] Samples of the discharge during drawdown of raceways or rearing pond for fish release sample(s) must be collected during the last quarter of the volume of the rearing pond or raceway drawdown for release event.

[27] If multiple raceways or rearing ponds are being drawn down for fish release at the same time, grab samples from individual discharges may be combined into a flow-proportional composite sample for analysis.

[28] Appropriate flow measurements devices and methods consistent with accepted aquaculture practice must be selected and used to ensure the accuracy and reliability of measurements of the quantity of monitored flows.

[29] "E" means "Effluent." Rearing pond or raceway effluent grab sample must be taken prior to mixing with receiving waters or any other flow.

2.2.1 Drug and Chemical Applications

The permittee is required to maintain records of drug application and chemical usage at its facility; these need to be listed on the permit application and in the annual report. In addition, there are specific requirements to report orally and in writing when investigational new animal drugs are used for the first time and when drugs are used outside the label uses, as follows:

Only disease control chemicals and drugs approved for hatchery use by the U.S. Food and Drug Administration or by the EPA may be used, except

> *(1) Investigational New Animal Drugs (INADs) and extralabel drug use as prescribed by a veterinarian, provide a written report to EPA within 30 days after initiating use of the drug.*
>
> *(2) Low Regulatory Priority compounds in accordance with conditions included on the list in the Food and Drug Administration (FDA) policy 1240.4200: Enforcement Priorities for Drug Use in*

Aquaculture (08/09/2002; 4/26/07 minor revisions)[a] *p.13--15. (See Appendix C of the permit). These compounds must be reported in the permit application and in annual reports. If they have not previously been reported on a permit application, the permittee must report its first use in accordance with the requirements in § IV.A.2.b [of the permit].*

(3) Potassium permanganate, a deferred regulatory priority drug, also needs to be reported on the permit application, the annual report and upon first use in accordance.

All drugs, pesticides and other chemicals must be applied in accordance with label directions.

Records required:

Records of all applications of drugs, pesticides, and other chemicals must be maintained and must, at a minimum, include information specified in Appendix D [of the permit]. This information must also be summarized in the annual report.

2.3 BEST MANAGEMENT PRACTICES PLAN

Within 90 days of becoming authorized to discharge under the permit, the permittee will be required to prepare and implement a Best Management Practices (BMP) Plan to prevent or minimize the generation and discharge of pollutants from the facility to waters of the United States.

Through implementation of the BMP Plan, the permittee will ensure that methods of pollution prevention, control, and treatment will be applied to all wastewaters to be discharged. Disposal of wastes into the environment should be conducted in such a way as to have a minimal environmental impact. At a minimum, the BMP Plan will need to address applicable operating limitations and best management practices (BMPs) specified in the permit.

The BMP Plan must include, at a minimum, the following BMPs. Where a particular practice below is infeasible, the permittee will substitute another practice to achieve the same end.

1. Materials Storage:

   (1) Ensure proper storage of drugs and other chemicals to prevent spills that may result in the discharge to waters of the United States.

   (2) Implement procedures for properly containing, cleaning, and disposing of any spilled materials.

2. Structural Maintenance

   (1) Routinely inspect rearing and holding units and waste collection and containment systems to identify and promptly repair damage.

   (2) Regularly conduct maintenance of rearing and holding units and waste collection and containment systems to ensure their proper function.

[a] http://www.fda.gov/cvm/Policy_Procedures/4200.pdf

3. Record keeping.

   (1) Document feed amounts and numbers and weights of aquatic animals to calculate feed conversion ratios.

   (2) Document the frequency of cleanings, inspections, maintenance, and repairs.

4. Training Requirements

   (1) Train all relevant personnel in spill prevention and how to respond in the event of a spill to ensure proper clean-up and disposal of spilled materials.

   (2) Train personnel on proper structural inspection and maintenance of rearing and holding units and waste collection and containment systems.

5. Operational Requirements

   (1) Raceways and ponds must be cleaned at such a frequency and in such a manner that minimizes accumulated solids discharged to waters of the U.S.

   (2) Fish feeding must be conducted in such a manner as to minimize the discharge of unconsumed food.

   (3) Fish grading, harvesting and other activities within ponds or raceways must be conducted in such a way as to minimize the discharge of accumulated solids and blood wastes.

   (4) Animal mortalities must be removed and disposed of on a regular basis to the greatest extent feasible.

   (5) Water used in the rearing and holding units or hauling trucks that is disinfected with chlorine or other chemicals must be treated before it is discharged to waters of the U.S.

   (6) Treatment equipment used to control the discharge of floating, suspended or submerged matter must be cleaned and maintained at a frequency sufficient to minimize overflow or bypass of the treatment unit by floating, suspended, or submerged matter; turbulent flow must be minimized to avoid entrainment of solids.

   (7) Procedures must be implemented to prevent fish from entering quiescent zones, full-flow and off-line settling basins. Fish that have entered quiescent zones or basins must be removed as soon as practicable.

   (8) Procedures must be implemented to minimize the release of diseased fish from the facility.

   (9) All drugs and pesticides must be used in accordance with applicable label directions (FIFRA or FDA), except under the following conditions, both of which must be reported to EPA in accordance with § V.A, below:

      (a) Participation in Investigational New Animal Drug (INAD) studies, using established protocols; or

      (b) Extralabel drug use, as prescribed by a veterinarian.

   (10) Identify and implement procedures to collect, store, and dispose of wastes, such as biological wastes. Such wastes include fish mortalities and other processing solid wastes from aquaculture operations.

Chapter 3 SPECIES STATUS AND LIFE HISTORY

In consultation with the NOAA Fisheries and the U.S. Fish and Wildlife Service, two bird species, three salmonid ESUs, three terrestrial mammalian species, and three plant species were identified as listed species for Chelan County. In addition, there are one terrestrial mammalian species and one bird species listed as candidate species for Chelan County. Table 3-1 lists these species, their current status, and the Federal Register (FR) final rule notice for each species. Table 3-2 lists the FR final rule notices for critical habitat designation for some of these species.

Table 3-1. Summary of Species Listed Under the ESA Within Chelan County

Species	ESU[a]/ DPS[b]/Population	Present Status	Federal Register Notice	
Northern Spotted Owl (*Strix occidentalis caurina*)	N/D	Threatened	55 FR 26114	06/26/90
Marbled Murrelet (*Brachyramphus marmoratus*)	Pacific Coast	Threatened	57 FR 45329	10/01/92
Chinook Salmon (*Oncorhynchus tshawytscha*)	Upper Columbia River Spring Run[a]	Endangered	64 FR 14308	03/24/99
Steelhead (*Oncorhynchus mykiss*)	Upper Columbia River[a]	Endangered	62 FR 43937	08/18/97
Bull Trout (*Salvelinus confluentus*)	Columbia River Basin[b]	Threatened	62 FR 32268	06/10/98
Grizzly Bear (*Ursus arctos horribilis*)	Lower 48 states	Threatened	40 FR 31734	07/28/75
Canada Lynx (*Lynx canadensis*)	Contiguous US[b]	Threatened	68 FR 40076	07/03/03
Gray Wolf (*Canis lupus*)	Northern Rocky Mountain DPS	Endangered		
Showy stickseed (*Hackelia venusta*)	Tumwater Canyon, Chelan County	Endangered	67 FR 5515	02/06/02
Wenatchee Mountains checker-mallow (*Sidalcea oregana* var. *calva*)	Wenatchee Mountains, Chelan County	Endangered	64 FR 71680	12/22/99
Ute ladies'-tresses (*Spiranthes diluvialis*)		Threatened	57 FR 2048	01/17/92
Yellow-billed Cuckoo (*Coccyzus americanus*)	Western U.S.	Candidate	66 FR 38611	07/25/01
Fisher (*Martes pennanti*)	West Coast DPS	Candidate	69 FR 18770	04/08/04

[a] Evolutionarily Significant Unit
[b] Distinct Population Segment
N/D Not Determined
N/A Not Applicable

Table 3-2. Summary of Critical Habitat Designations for Species Listed Under the ESA Within Chelan County				
Species	**ESU[a]/ DPS[b]/Population**	**Present Status**	**Federal Register Listing Notice**	
Northern Spotted Owl (*Strix occidentalis caurina*)	N/D	Final Rule	57 FR 1796	01/15/92
Marbled Murrelet (*Brachyramphus marmoratus)*	Pacific Coast	Final Rule	61 FR 26255	05/24/96
Chinook Salmon (*Oncorhynchus tshawytscha*)	Upper Columbia River Spring Run[a]	Final Rule	70 FR 52630	09/02/05
Steelhead (*Oncorhynchus mykiss)*	Upper Columbia River[a]	Final Rule	70 FR 52630	09/02/05
Bull Trout (*Salvelinus confluentus*)	Columbia River Basin[b]	Final Rule	70 FR 56213	09/26/05
Canada Lynx (*Lynx canadensis*)	Contiguous US[b]	Threatened	74 FR 8616	02/25/09
Wenatchee Mountains checker-mallow (*Sidalcea oregana* var. *calva*)	Wenatchee Mountains	Endangered	66 FR 46536	09/06/01

a Evolutionarily Significant Unit
b Distinct Population Segment
N/D Not Determined
N/A Not applicable

3.1 SPECIES NOT LIKELY TO OCCUR IN THE ACTION AREA

There are a number of species that while listed as threatened or endangered for Chelan County, Washington, due to their habitat requirements, known locations or limited populations, are not likely to occur in the action area. These species are listed below along with the rationale for why they would not be located in the action area. Since these species will have no exposure to the effluent from the hatchery covered in this permit, EPA has determined there would be no effect on the following species. Since these species are not likely to occur in the action area and will have no effect from the effluents covered in this permit, they are not discussed in additional detail.

3.1.1. Northern Spotted Owl

The northern spotted owl inhabits old-growth forests of the Pacific Coast region from southwestern British Columbia to central California. Spotted owls eat a broad range of mammals, birds, amphibians, insects and reptiles with their primary prey being flying squirrels, voles, mice and woodrats (Forsman et al 1984, Thomas et al. 1990, Carey et al. 1992). Critical habitat was designated for the northern spotted owl on January 15, 1992 (57 FR 1796). The critical habitat for the northern spotted owl includes Western Washington, but also extending into parts of Chelan County east of the Cascade crest, Western Oregon, and Northwestern California to San Francisco Bay. The potential for exposure for the Northern Spotted Owl to effluents from the facility covered in this permit is unlikely as the birds prefer habitat that includes old-growth forests and are unlikely to occur near the hatchery effluents as their prey is mostly terrestrial vertebrates that are unlikely to be located near the effluents of the hatchery covered in this permit. Since this species is will have no exposure to the effluent from the facility, EPA has determined that the NPDES permit for LNFH will have **no effect** on the northern spotted owl.

3.1.2. Marbled Murrelet

The marbled murrelet, a small sea bird that nests in the coastal old-growth forests of the Pacific Northwest, inhabits the Pacific coasts of North America from the Bering Sea to central California. In contrast to other seabirds, murrelets do not form dense colonies and may fly 70 km or more inland to nest, generally in older coniferous forests. They are more commonly found inland during the summer breeding season, but make daily trips to the ocean to gather food, primarily fish and invertebrates and have been detected in forests throughout the year. The total North American population of marbled murrelets is estimated to be 360,000 individuals. Approximately 85 percent of this population breeds along the coast of Alaska. Estimates for Washington, Oregon, and California vary between 16,500 and 35,000 murrelets (Ralph et al. 1995).When not nesting, the birds live at sea, spending their days feeding and then moving several kilometers offshore at night (SEI 1999). Critical habitat has been designated for the marbled murrelet throughout the states of Washington, Oregon and California (61 FR 26255). The marbled murrelet differs from other seabirds in that its primary nesting habitat is old-growth coniferous forest within 50 to 75 miles of the coast. Following the breeding season, murrelets appear to disperse and are less concentrated in the immediate nearshore coastal waters (Strachan et al. 1995). Murrelet prey species include small inshore fish such as the sand land, Pacific herring, capelin, and invertebrates including the *Euphausid pacifica* and *Thysanoessa spinifera* (Sanger 1987, Sealy 1975). Most of the facilities covered under this permit discharge to freshwater rivers. Due to the habitat preferences of the marbled murrelet, this species is not likely to be in the action area of the facility covered under this permit; therefore, EPA has determined that the NPDES permit for LNFH will have **no effect** on the marbled murrelet.

3.1.3. Grizzly Bear

The present range of the grizzly bear in North America includes Alaska, northern and western Canada, northern Continental Divide in Montana, Cabinet/Yaak Mountains in Montana/Idaho, Selkirk Mountains in Idaho/northeast Washington, Northern Cascades in north central Washington, Selway/Bitterroot Mountains, and the Yellowstone area of Wyoming, Montana and Idaho. The range of the grizzly bear in Washington is in the Cascade Mountains in the Northern part of the state, which may extend as far south as the facility. However, it is a remnant population of likely no more than 20 animals in this extensive area. Threats to the species in this recovery zone include incomplete habitat protection measures, small population size, and population fragmentation resulting in genetic isolation. Since the hatchery and its discharge are located in a populated area, this species is not likely to occur in the action area. EPA has determined that the NPDES permit for LNFH will have **no effect** on the grizzly bear.

3.1.4. Gray Wolf

The Northern Rocky Mountain DPS of the gray wolf includes all of Montana, Idaho, and Wyoming and the eastern one-third of Washington and Oregon and parts of north-central Utah. However, wolves are rarely seen in Washington. There have been reports of individual wolves and wolf packs in the North Cascades of Washington (Almack and Fitkin 1998, pp. 7-13) and recent reports (The Seattle Times, July 24, 2008) verify the presence of wolves in Okanogan County which is adjacent to Chelan County on the north. The gray wolves located in Washington prefer habitat in remote wooded areas of the state. Since the hatchery and its discharge are located in a populated area near the southern boundary of Chelan County, this species is not likely to occur in the action area. EPA has determined that the NPDES permit LNFH will have **no effect** on the gray wolf.

3.1.5. Canada Lynx

The Canada Lynx was considered historically resident in 16 states represented by five ecologically distinct regions: Cascade Range (Washington, Oregon); northern Rocky Mountains (northeastern Washington, southeastern Oregon, Idaho, Montana, western Wyoming, northern Utah); southern Rocky Mountains (southeastern Wyoming, Colorado); northern Great Lakes (Minnesota, Wisconsin, Michigan); and northern New England (Maine, New Hampshire, Vermont, New York, Pennsylvania, Massachusetts). Canada lynx generally occur in boreal and montane regions dominated by coniferous or mixed forest with thick undergrowth, but they may also enter open forest, rocky areas, and tundra to forage for abundant prey. When inactive or birthing, lynx occupy dens typically located in hollow trees, under stumps, or in thick brush. Den sites tend to be in mature or old growth stands with a high density of logs (Koehler 1990). The Canada lynx in the Cascade Range includes habitat from the North Cascades and Loomis forest to the Columbian Highlands and Selkirk mountains. Although the critical habitat for Canada Lynx extends into the areas of Chelan County north and east of Lake Chelan, it does not extend southward of Lake Chelan. Therefore, this species is not likely to occur in the action area covered under this permit, and EPA has determined that the NPDES permit for LNFH will have **no effect** on the Canada lynx.

3.1.6. Showy Stickseed

Showy stickseed is a perennial, herbaceous plant in the Borage family (Boraginaceae). The plant is a short, moderately stout species, 8 to 16 inches in height, and forms 5-lobed, white flowers. Showy stickseed grows on sparsely vegetated, granitic scree on unstable, steep slopes on the east slope of the central Cascade Mountains of Washington. The species has always been restricted in its distribution; the one population is found entirely on USDA Forest Service land on less than 2.5 acres in Tumwater Canyon near Leavenworth, Washington. Although the only population of this species is only a few miles away, because it is in a different watershed on granitic scree slopes, this species is not present in the action area of this permit. Therefore, EPA has determined that the NPDES permit for LNFH will have **no effect** on Showy stickseed.

3.1.7. Wenatchee Mountains Checker-mallow

Wenatchee Mountains checker-mallow *(Sidalcea oregana var. calva)* is known only in the Wenatchee Mountains of central Washington. Five known populations, totaling 3,300 plants, occur at mid-elevations in wetlands and moist meadows in the Icicle Creek and Peshastin Creek watersheds and on the Camas Lands in Chelan County. Elevations range from 1,600 to 3,300 feet. Although the populations of this species are in the general vicinity of the facility, they are found at higher elevations than the 1,140 feet at which LNFH is situated. Therefore, EPA has determined that the NPDES permit for LNFH will have **no effect** on Wenatchee Mountains checker-mallow.

3.1.8. Ute Ladies'-Tresses

The Ute Ladies'-tresses is a perennial, terrestrial orchid found in moist soils in mesic or wet meadows near springs, lakes or perennial streams. The orchid occurs along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows along perennial streams. It typically occurs in stable wetland and seepy areas associated with old landscape features within historical floodplains of major rivers, as well as in wetlands and seeps near freshwater lakes or springs. The main factors threatening this species are loss and modification of habitat and modification of the hydrology of existing and potential habitat. The species ranges in elevation from 720 to 1,830 ft in Washington. The only known populations in Chelan County are along the reservoir shore of the Columbia River near the town of Chelan. Since this is distant from the action area and upstream of the confluence of the Wenatchee River with the Columbia River, EPA has determined that the NPDES permit for LNFH will have **no effect** on Ute Ladies'-Tresses.

3.1.9. Yellow-billed Cuckoo

Historically, the yellow-billed cuckoo bred throughout much of North America in willow and cottonwood forests along rivers and streams. Available data suggests that within the last 50 years the species' distribution west of the Rocky Mountains has declined substantially, largely due to loss of streamside habitat. Yellow-billed Cuckoos are officially considered extirpated in Washington, and the occasional sightings are considered vagrants. Therefore, EPA has determined that the NPDES permit for LNFH will have **no effect** on the yellow-billed cuckoo.

3.1.10 Fisher

A resident of coniferous and mixed coniferous forests, the fisher once occurred throughout much of Canada, the northern United States, and the western United States. Fisher populations have declined primarily due to loss of habitat from timber harvest activities and trapping. In the western United States and Canadian Provinces, the number of fishers has been greatly reduced and their populations fragmented, and they are no longer believed to occupy the lower mainland of British Columbia and the area west of Okanogan extending down to Washington. Fishers were re-introduced into the Olympic Peninsula of Washington in January and March of 2008, but are otherwise believed to be extirpated from the state. Therefore, EPA has determined that the NPDES permit for LNFH will have **no effect** on the fisher.

3.2 SPECIES PRESENT IN THE ACTION AREA

This section provides status and life history information on 3 salmonids listed under the ESA that occur in the action area.

3.2.1 Chinook Salmon

(The following summary is taken from 63 FR 11481, 3/9/98).

Chinook salmon are easily distinguished from other *Oncorhynchus* species by their large size. Adults weighing over 120 pounds have been caught in North American waters. Chinook salmon are very similar to coho salmon in appearance while at sea (blue-green back with silver flanks), except for their large size, small black spots on both lobes of the tail, and black pigment along the base of the teeth. Chinook salmon are anadromous and semelparous. This means that as adults, they migrate from a marine environment into the freshwater streams and rivers of their birth (anadromous) where they spawn and die (semelparous). Adult female Chinook will prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth and velocity. Redds will vary widely in size and in location within the stream or river. The adult female Chinook may deposit eggs in four to five "nesting pockets" within a single redd. After laying eggs in a redd, adult Chinook will guard the redd from four to 25 days before dying. Chinook salmon eggs will hatch, depending upon water temperatures, between 90 to 150 days after deposition. Stream flow, gravel quality, and silt load all significantly influence the survival of developing Chinook salmon eggs. Juvenile Chinook may spend from three months to two years in freshwater after emergence and before migrating to estuarine areas as smolts, and then into the ocean to feed and mature.

Among Chinook salmon two distinct races have evolved. One race, described as a "stream-type" Chinook, is found most commonly in headwater streams. Stream-type Chinook salmon have a longer freshwater residency and perform extensive offshore migrations before returning to their natal streams in the spring or summer months. The second race is called the "ocean-type" Chinook, which is commonly found in coastal steams in North America. Ocean-type Chinook typically migrate to sea within the first three months after emergence, but they may spend up to a year in freshwater prior to emigration. They also spend their ocean life in coastal waters. Ocean-type Chinook salmon return to their natal streams or rivers as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate. The difference between these life history types is also physical, with both genetic and morphological foundations.

Juvenile stream- and ocean-type Chinook salmon have adapted to different ecological niches. Ocean-type Chinook salmon tend to utilize estuaries and coastal areas more extensively for juvenile rearing. The brackish water areas in estuaries also moderate physiological stress during parr-smolt transition. The development of the ocean-type life history strategy may have been a response to the limited carrying capacity of smaller stream systems and glacially scoured, unproductive, watersheds, or a means of avoiding the impact of seasonal floods in the lower portion of many watersheds.

Stream-type juveniles are much more dependent on freshwater stream ecosystems because of their extended residence in these areas. A stream-type life history may be adapted to those watersheds, or parts of watersheds, that are more consistently productive and less susceptible to dramatic changes in water flow or which have environmental conditions that would severely limit the success of sub-yearling smolts. At the time of saltwater entry, stream-type (yearling) smolts are much larger, averaging 73-134 mm depending on the river system, than their ocean-type (sub-yearling) counterparts and are, therefore, able to move offshore relatively quickly.

Coast wide, Chinook salmon remain at sea for one to six years (more common, two to four years), with the exception of a small proportion of yearling males, called jack salmon, which mature in freshwater or return after two or three months in salt water. Ocean- and steam-type Chinook salmon are recovered differentially in coastal and mid-ocean fisheries, indicating divergent migratory routes. Ocean-type Chinook salmon tend to migrate along the coast, while stream-type Chinook salmon are found far from the coast in the central North Pacific. Differences in the ocean distribution of specific stocks may be indicative of resource partitioning and may be important to the success of the species as a whole.

There is a significant genetic influence to the freshwater component of the returning adult migratory process. A number of studies show that Chinook salmon return to their natal streams with a high degree of fidelity. Salmon may have evolved this trait as a method of ensuring an adequate incubation and rearing habitat. It also provides a mechanism for reproductive isolation and local adaptation. Conversely, returning to a stream other than that of one's origin is important in colonizing new areas and responding to unfavorable or perturbed conditions at the natal stream.

Chinook salmon stocks exhibit considerable variability in size and age of maturation, and at least some portion of this variation is genetically determined. The relationship between size and length of migration may also reflect the earlier timing of river entry and the cessation of feeding for Chinook salmon stocks that migrate to the upper reaches of river systems. Body size, which is correlated with age, may be an important factor in migration and redd construction success. Under high density conditions on the spawning ground, natural selection may produce stocks with exceptionally large-sized returning adults.

Early researchers recorded the existence of different temporal "runs" or modes in the migration of Chinook salmon from the ocean to freshwater. Freshwater entry and spawning timing are believed to be related to local temperature and water flow regimes. Seasonal "runs" (i.e., spring, summer, fall, or winter) have been identified on the basis of when adult Chinook salmon enter freshwater to begin their spawning migration. However, distinct runs also differ in the degree of maturation at the time of river entry, the thermal regime and flow characteristics of their spawning site, and their actual time of spawning. Egg deposition must occur at a time to ensure that fry emerge during the following spring when the river or estuary productivity is sufficient for juvenile survival and growth.

Pathogen resistance is another locally adapted trait. Chinook salmon from the Columbia River drainage were less susceptible to *Ceratomyxa shasta*, an endemic pathogen, than stocks from coastal rivers where the disease is not known to occur. Alaskan and Columbia River stocks of Chinook salmon exhibit different levels of susceptibility to the infectious hematopoietic necrosis virus (IHNV).

The preferred temperature range for Chinook salmon has been variously described as 12.2-13.9 degrees C (Brett 1952), 10-15.6 degrees C (Burrows 1963), or 13-18 degrees C (Theurer et al. 1985). Temperatures for optimal egg incubation are 5.0-14.4 degrees C (Bell 1986). The upper lethal temperature limit is 25.1 degrees C (Brett 1952) but may be lower depending on other water quality factors (Ebel et al. 1971). Variability in temperature tolerance between populations is likely due to selection for local conditions; however, there is little information on the genetic basis of this trait.

Dissolved oxygen concentrations of 5.0 mg/L or greater are needed for successful egg development in redds for water temperatures between 4-14 degrees C (Reiser and Bjornn 1979, as cited in NMFS 1996). Freshwater juveniles avoid water with dissolved oxygen concentrations below 4.5 mg/L at 20 degrees C (Whitmore et al. 1960). Migrating adults will pass through water with dissolved oxygen levels as low as 3.5-4.0 mg/L (Fujioka 1970; Alabaster 1988, 1989).

3.2.1.1. Upper Columbia River Spring-run Chinook Salmon

Status

The Upper Columbia River (UCR) spring-run Chinook salmon ESU was listed as endangered on March 24, 1999 (64 FR 14308).

Geographic Range and Spatial Distribution

The UCR ESU includes spring-run Chinook populations found in Columbia River tributaries between Rock Island and Chief Joseph Dams, notably the Wenatchee, Entiat, and Methow River Basins. The populations are genetically and ecologically separate from the summer- and fall-run populations in the lower parts of many of the same river systems (Meyers et al. 1998). Although fish in this ESU are genetically similar to spring Chinook in adjacent ESUs, they are distinguished by ecological differences in spawning and rearing habitat preferences. For example, spring-run Chinook in upper Columbia River tributaries spawn at lower elevations (500 to 1,000 m) than in the Snake and John Day River systems.

Critical Habitat

The critical habitat for UCR Chinook salmon was initially designated on February 16, 2000 (65 FR 7764) and revised on September 2, 2005 (70 FR 52630). The initial designation included all river reaches accessible to listed Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Also included were river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded were the areas above Chief Joseph Dam and areas above longstanding, naturally impassable barriers (e.g., natural waterfalls in existence for at least several hundred years). In 2005, the only change to the designated habitat was that the conservation rating for the Upper Columbia/Swamp Creek watershed in the Chief Joseph basin was changed from medium to high.

Historical Information

The upper Columbia River populations were intermixed during the Grand Coulee Fish Maintenance Project (1939 through 1943), resulting in loss of genetic diversity between populations in the ESU. Homogenization remains an important feature of the ESU. Fish abundance has tended downward both recently and over the long term. At least six former populations from this ESU are now extinct, and nearly all extant populations have fewer than 100 wild spawners.

Life History

UCR spring-run Chinook are considered stream-type fish, which spend one or more years as fry or parr in freshwater before migrating to sea. Stream-type Chinook move offshore early in their ocean life and maintain a more offshore distribution throughout their ocean life than ocean-type Chinook salmon. Once in the ocean, UCR spring-run Chinook salmon can migrate as far as western Alaska during the ocean phase of their life. Most stream-type Chinook mature at 4 years of age.

Habitat and Hydrology

Spawning and rearing habitat in the Columbia River and its tributaries upstream of the Yakima River includes dry areas where conditions are less conducive to Chinook survival than in many other parts of the Columbia River Basin (Mullan et al. 1992). Salmon in this ESU must pass up to nine federal and private dams, and Chief Joseph Dam prevents access to historical spawning grounds farther upstream. Degradation of remaining spawning and rearing habitat continues to be a major concern associated with urbanization, irrigation projects, and livestock grazing along riparian corridors.

Hatchery Influence

Spring-run Chinook salmon from the Carson National Fish Hatchery (a large, composite, nonnative stock) were introduced into, and have been released from, local hatcheries (Leavenworth, Entiat, and Winthrop National Fish Hatcheries [NFH]). Little evidence suggests that these hatchery fish stray into wild areas or hybridize with naturally spawning populations. In addition to these national production hatcheries, two supplementation hatcheries are operated by the Washington Department of Fish and Wildlife (WDFW) in this ESU. The Methow Fish Hatchery Complex (where operations began in 1992) and the Rock Island Fish Hatchery Complex (where operations began in 1989) were both designed to implement supplementation programs for naturally spawning populations on the Methow and Wenatchee Rivers, respectively (Chapman et al. 1995).

Population Trends and Risks

Access to a substantial portion of historical habitat was blocked by Chief Joseph and Grand Coulee Dams. There are local habitat problems related to irrigation diversions and hydroelectric development, as well as degraded riparian and in-stream habitat from urbanization and livestock grazing. Mainstem Columbia River hydroelectric development has resulted in a major disruption of migration corridors and affected flow regimes and estuarine habitat. Some populations in this ESU must migrate through nine mainstem dams.

Artificial propagation efforts have had a significant impact on spring-run populations in this ESU, either through hatchery-based enhancement or extensive trapping and transportation. Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Given the lack of information on Chinook salmon stocks that are presumed to be extinct, the relationship of these stocks to existing ESUs is uncertain. Recent total abundance of this ESU is quite low, and escapements in 1994-1996 were the lowest in at least 60 years. At least six populations of spring Chinook salmon in this ESU have become extinct, and almost all remaining naturally spawning populations have fewer than 100 spawners. Risk assessments conducted by NOAA Fisheries showed extinction risks for UCR spring Chinook salmon of 50 percent for the Methow, 98 percent for the Wenatchee, and 99 percent for the Entiat spawning populations (Cooney 2002). In 2002, the spring Chinook count at Priest Rapids Dam was 34,083 with 24,000 arriving at Rock Island Dam. The 2002 count was about 67.6 percent and 242 percent of the respective 2001 and 10-year average adult spring Chinook count at Priest Rapids Dam. Numbers of wild Chinook in tributaries located above Rock Island Dam were reported to still be at low levels (FPC 2003).

3.2.2 Steelhead

The steelhead is the anadromous form of the rainbow trout (*O. mykiss*), which occurs in two subspecies, *O. mykiss irideus* and *O. mykiss gaidneri*. Whereas stream-resident rainbow trout may complete their life cycle in a limited area of a small stream and attain a length of only 8 inches or so, steelhead may spend half their lives at sea, roaming for thousands of miles in the North Pacific Ocean. Steelhead return to spawn at sizes ranging from about 24 inches and 5 pounds to about 36 to 40 inches or more and 20 pounds or more (Behnke 2002).

Biologically, steelhead can be divided into two reproductive ecotypes, based on their state of sexual maturity at the time of river entry. These two ecotypes are termed "stream-maturing" and "ocean-maturing". Stream-maturing steelhead enter fresh water in a sexually immature condition and require from several months to a year to mature and spawn. These fish are often referred to as "summer run" steelhead. Ocean-maturing steelhead enter fresh water with well-developed gonads and spawn shortly after river entry. These fish are commonly referred to as "winter-run" steelhead. In the Columbia River basin, essentially all steelhead that return to streams east of the Cascade Mountains are stream-maturing. Ocean-maturing fish are the predominate ecotype in coastal streams and lower Columbia River tributaries (ACOE 2000).

All but one of the *O. m. gairdneri* steelhead populations migrating east of the Cascade Range are characterized as summer-run steelhead (entering the Columbia River from May into the early fall in

October); the one exception is a winter-run steelhead spawning in Fifteenmile Creek, which drains the eastern side of the Cascades in Oregon. The genetic traits of Fifteenmile Creek steelhead make it intermediate between the subspecies *irideus* and *gairdneri*. Steelhead of the subspecies *irideus* are mainly winter-run fish, but *irideus* also has summer runs. Considering the entire range of *irideus* from California to Alaska, steelhead can be found entering one river or another in every month of the year (Behnke 2002).

Native steelhead populations in Washington begin spawning in February or March. Among inland steelhead, Columbia River populations from tributaries upstream of the Yakima River spawn later than most downstream populations.

Depending on water temperature, fertilized steelhead eggs may incubate in redds for 1.5 to 4 months before hatching as "alevins". Following yolk sac absorption, young juveniles or "fry" emerge from the gravel and begin active feeding. Juveniles rear in fresh water for 1 to 4 years, then migrate to the ocean as smolts. Downstream migration of wild steelhead smolts in the lower Columbia River begins in April, peaks in mid-May, and is essentially complete by the end of June (ACOE 2000). Previous studies of the timing and duration of steelhead downstream migration indicate that they typically move quickly through the lower Columbia River estuary with an average daily movement of about 21 kilometers (ACOE 2000).

Juvenile steelhead generally spend two years in freshwater before smolting and migrating to the ocean at lengths of about 6 to 8 inches. After about 15 to 30 months of ocean life, most steelhead return to their natal rivers to spawn. Unlike Pacific salmon, steelhead do not all die soon after spawning, but the rate of survival to repeat spawning is generally low - about 10 percent (Behnke 2002).

3.2.2.1 Upper Columbia River Steelhead

Status

The UCR steelhead ESU was listed as threatened on August 18, 1997 (62FR43937).

Geographic Range and Spatial Distribution

This inland steelhead ESU occupies the Columbia River basin upstream from the Yakima River to the U.S./Canada border. Rivers in the area primarily drain the east slope of the northern Cascade Mountains and include the Wenatchee, Entiat, Methow, and Okanogan River basins.

Critical Habitat

The critical habitat for UCR steelhead was initially designated on February 16, 2000 (65 FR 7764), and was revised on September 2, 2005 (70 FR 52630). The initial designated habitat consisted of all river reaches accessible to listed steelhead in Columbia River tributaries upstream of the Yakima River, Washington, and downstream of Chief Joseph Dam. Also included were river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence with the Snake River. Excluded were areas above the Chief Joseph Dam and areas above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Changes to the critical habitat included changing the conservation rating from medium to high on Swamp Creek of the Upper Columbia, including the Jordan/Tumwater watershed and removing 1 mile of unoccupied habitat on the Nason/Tumwater watershed.

Historical Information

Estimates of historical (pre-1960s) abundance specific to this ESU are available from fish counts at dams (NMFS 2000). Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size exceeding 5,000 adults for tributaries above Rock Island Dam (Chapman et al. 1994). Lower Columbia River harvests had already depressed fish stocks during the period these counts were taken, thus, the pre-fishery estimate should be viewed with caution.

Life History

Life history information for this ESU has been summarized by NMFS (2000). Steelhead in the UCR ESU remain in freshwater for up to a year before spawning. Smolt age is dominated by 2-year-olds. Based on limited data, steelhead from the Wenatchee and Entiat rivers return to freshwater after 1 year in salt water, whereas Methow River steelhead are primarily age-2-ocean (Howell et al. 1985). Life history characteristics for UCR steelhead are similar to those of other inland steelhead ESUs; however, some of the oldest smolt ages for steelhead, up to 7 years, are reported from this ESU. The relationship between anadromous and nonanadromous forms in the geographic area is unclear.

Habitat and Hydrology

Construction of the Chief Joseph and Grand Coulee dams caused blockages of substantial habitat, as did that of smaller dams on tributary rivers (NMFS 2000). Habitat issues for this ESU relate mostly to irrigation diversions and hydroelectric dams, as well as to degraded riparian and instream habitat from urbanization and livestock grazing.

Hatchery Influence

In an effort to preserve fish runs affected by the construction of the Grand Coulee Dam, which blocked fish passage in 1939, all anadromous fish migrating upstream were trapped at Rock Island Dam (Rkm 729) from 1939 through 1943 and either released to spawn in tributaries between Rock Island and Grand Coulee Dams or spawned in hatcheries and the offspring released in that area (Mullan et al. 1992; Chapman et al. 1994 IN: 50 CFR Parts 222 and 227). Through this process, stocks of all anadromous salmonids, including steelhead, which historically were native to several separate sub-basins above Rock Island Dam, were randomly redistributed among tributaries in the Rock Island-Grand Coulee reach. Exactly how this has affected stock composition of steelhead is unknown. Currently, hatchery fish are widespread and escape to spawn naturally throughout the region. Spawning escapement is dominated by hatchery-produced fish.

Population Trends and Risks

Habitat degradation, juvenile and adult mortality in the hydrosystem, and unfavorable environmental conditions in both marine and freshwater habitats have contributed to the declines and represent risk factors for the future. Harvest in lower river fisheries and genetic homogenization from composite broodstock collection are other factors that may contribute significant risk to the UCR steelhead ESU.

NMFS (2000) estimates that the median population growth rate (lambda) over a base period from 1990 through 1998 ranges from 0.94 to 0.66, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure et al. 2000). In 2002, the count of steelhead at Rock Island Dam was 15,286, compared to the 2001 count of 28,602 and the 10-year average return of 9,165. Of the total steelhead counted at Rock Island Dam in 2002, 10,353 were wild (non-clipped adipose fin) steelhead (FPC 2003).

3.2.3. Bull Trout

The bull trout is a member of the char family (*Salvelinus*) and is represented by different life history forms, including river-resident populations, lacustrine populations, and sea-run populations. The river-resident populations appear to be relatively rare (Behnke 2002).

The stream-resident form is subdivided into two basic types: one lives its entire life in small headwater streams, the other typically spawns in smaller tributary streams but spends most of its time foraging in larger rivers. This second form, often called "fluvial," occurs only in relatively larger river basins that contain a network of headwater spawning tributaries connected to larger riverine or marine habitat, allowing bull trout to undertake movements of more than 100 miles (Behnke 2002).

The northernmost distribution of bull trout occurs in the headwaters of the Yukon and Mackenzie River basins of Alaska and Canada. In Pacific Coast drainages, they occur in rivers of British Columbia southward to around Puget Sound. Bull trout are not native to Vancouver Island or other islands off the Pacific Coast of and Canada and southern Alaska. Native distribution includes the upper parts of the North and South Saskatchewan River drainages of Alberta, Canada (Behnke 2002).

To the south, a few bull trout populations persist in cold headwater tributary streams in the Upper Klamath Lake basin of Oregon. The southernmost population of bull trout once occurred in the McCloud River of California. However, those bull trout declined rapidly in the 1940s after construction of Shasta Dam (Behnke 2002).

3.2.3.1 Columbia River Basin Bull Trout

Status

The CR bull trout distinct population segment (DPS) was listed as threatened on June 10, 1998 (62 FR 32268). The following information on bull trout was taken from 63 FR 31647-31674 and USFWS 2002a).

Geographic Range and Spatial Distribution

The Columbia River population segment is from the northwestern United States and British Columbia, Canada. This population segment is comprised of 386 bull trout populations in Idaho, Montana, Oregon, and Washington with additional populations in British Columbia. The Columbia River population segment includes the entire Columbia River basin and all its tributaries, excluding the isolated bull trout populations found in the Jarbridge River in Nevada. Bull trout populations within the Columbia River population segment have declined from historic levels and are generally considered to be isolated and remnant.

Critical Habitat

Critical habitat has been designated for Columbia River Basin bull trout on September 26, 2005 (70 FR 56213). The critical habitat proposal for bull trout in the Columbia River basin calls for a total of 3,828 miles of streams in Oregon, Washington, Idaho, and Montana to be designated as critical bull trout habitat, along with 143,218 acres of lakes and reservoirs in those four states.

Life History

Bull trout are seldom found in waters where temperatures are warmer than 15EC to 17.8EC. Besides very cold water, bull trout require stable stream channels, clean spawning gravel, complex and diverse cover, and unblocked migration routes (USFWS 2002a). Because bull trout life history patterns include migratory and resident forms, both adults and juveniles are present in the streams throughout the year. Bull trout adults may begin to migrate from feeding to spawning grounds in the spring and migrate slowly throughout the summer (Pratt 1992).

Bull trout eggs incubate from 100 to 145 days, usually in winter, after which the alevins require 65 to 90 days to absorb their yolk sacs (Pratt 1992). They remain within the interstices of the streambed as fry for up to three weeks before filling their air bladder, reaching lengths of 25-28 mm, and emerging from the streambed in late April (McPhail and Murry 1979, Pratt 1992).

Population Trends and Risks

The Columbia River population segment includes bull trout residing in portions of Oregon, Washington, Idaho and Montana. Bull trout are estimated to have once occupied about 60 percent of the Columbia River basin; they presently are known or predicted to occur in less than half of watersheds in the historical range (Quigley and Arbelbide 1997), which amounts to approximately 27 percent of the basin (67 FR 71239). Another evaluation of the distribution and status of bull trout within the Columbia River and Klamath River basins indicates that bull trout are present in about 36 percent of the watersheds in their potential range and are estimated to have strong populations in only 6-12 percent of the potential range (Rieman et al. 1997). Among the many factors that contributed to the decline of the bull trout in the Columbia River and Klamath River basins, the following three factors seem to be particularly significant. First, fragmentation and isolation of local populations due to the proliferation of dams and water diversions which have eliminated habitat, altered water flow and temperature regimes and impeded migratory movements (Rieman and McIntyre 1993, Dunham and Rieman 1999). Second, degradation of spawning and rearing habitat in upper watershed areas, particularly alterations in sedimentation rates and water termperature resulting from past forest and rangeland management practices and intensive development of roads (Fraley and Shepard 1989). Thirdly, the introduction and spread of nonnative species particularly brook trout, and lake trout, which compete with bull trout for limited resources (Ratliff and Howell 1992, Leary et al. 1993).

Chapter 4 ENVIRONMENTAL BASELINE

The purpose of this section is to identify "the past and present effects of all Federal, State, or private activities in the action area, the anticipated effects of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the effect of State or private actions which are contemporaneous with the consultation in process" (50 CFR 402.02, definition of "effects of the action"). These factors affect the species' environment or critical habitat in the action area. The factors are described in relation to species' biological requirements in the action area.

4.1 DESCRIPTION OF THE ACTION AREA

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402). The action area for the action of approval of NPDES Permit WA-0001902 for the wastewater discharge from Leavenworth National Fish Hatchery, Leavenworth, Washington, is Icicle Creek adjacent to and downstream from the discharge point at River Mile 2.9.

The NPDES permit expires after 5 years. If effects to listed species change, that would trigger initiation of consultation. Since salmonids are the main species of concern, we would not expect the initiation trigger to be tripped during the permit period.

4.2 BIOLOGICAL REQUIREMENTS IN ACTION AREA

The biological requirements of the life history stages of ESA-listed species evaluated in this BE are met through access to essential features of critical habitat. Essential features include adequate substrate (especially spawning gravel), water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and migration conditions.

4.3 CURRENT STATUS OF THE ENVIRONMENT

In 2008, Ecology conducted a statewide Water Quality Assessment 305(b) report and 303(d) list, which EPA approved on January 29, 2009.

4.3.1 Aquatic Life Uses

The data collected as part of Washington's 2008 305(b) report for indicators with numeric criteria in the water quality standards were used from sampling stations to assess the support or impairment of specific designated uses. The indicators assessed were temperature, dissolved oxygen, and pH, The specific designated uses assessed were fish migration, fish spawning, salmonid spawning, primary contact recreation, and secondary contact recreation. This BE provides information only for fish migration, fish spawning, and salmonid spawning. Other uses designated in the standards were not assessed due to the lack of specific numeric criteria. If 25 percent or greater of the data exceed any one criterion, support of the specific use was considered "poor." If more than 11 percent but less than 25 percent of the data exceed the criterion, support of the specific use was assessed as "fair." If less than 10 percent of the data exceed the criterion, support of the use was considered "good". The overall "Aquatic Life" use support assessments were rolled up from assessments of the related individual designated uses classified in the standards. If one or more of the related individual uses assessed at a station are identified as fair or poor, the overall aquatic life use at the station were considered impaired. If all these uses assessed at a station are identified as good, then the overall aquatic life use at the station would be considered as good (Ecology 2008).

4.3.4 Washington State's 2008 Water Quality Assessment [303(d) List]

The federal Clean Water Act adopted in 1972 requires that all states restore their waters to be "fishable and swimmable." The Clean Water Act established a process to identify and clean up polluted waters. Every two years, all states are required to prepare a list of water bodies that do not meet water quality standards. This list is called the 303(d) list because the process is described in Section 303(d) of the Clean Water Act (Ecology 2008).

The Washington Department of Ecology (Ecology) has prepared an assessment of water quality in Washington. Assessed waters include all the rivers, lakes and marine waters in the state where data were available. To develop the list, Ecology compiles its own water quality data and invites other groups to submit water quality data that they have collected. All data submitted need to be collected using appropriate scientific methods (Ecology 2008).

The assessed waters are listed in categories that describe the status of water quality. For those waters that are in the polluted-water category, beneficial uses– such as drinking, recreation, aquatic habitat, and industrial use – are impaired by pollution (Ecology 2008).

This system for assessment defines segments of rivers, streams, and lakes of less than 1,500 acres as that portion of the water body lying within a given section of a township and range (about a one mile square). Water bodies larger than 1,500 acres in size are subdivided by grid cells sized to 2.25 seconds of latitude/longitude per side. The Columbia River and Snake River areas were also segmented in grids. Therefore, each listing for a water body and parameter represents a one-mile stretch of river, or approximately a 500-foot square grid (this varies depending on the latitude and longitude).

Ecology adopted revisions to their Water Quality Standards on December 21, 2006.

Icicle Creek in the segment just downstream of the LNFH discharge is listed in the 2008 303(d) list for pH and for dissolved oxygen.

4.3.5 Wenatchee River Total Maximum Daily Load (TMDL)

In August 2009, Ecology finalized its Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load Water Quality Improvement Report (Ecology 2009). EPA approved the TMDL on August 26, 2009.

Nutrients are substances required by organisms to grow and survive, such as nitrogen and phosphorus. Nutrients play an essential role in primary productivity which, in turn, influences dissolved oxygen (DO) and pH. Nitrogen and phosphorus are present from natural geologic or organic sources. They also are present in wastewater, fertilizers, and other organic residues. Nitrogen is often fixed from the atmosphere by primary producers living in aquatic environments (Kalff, 2002).

Nutrients such as phosphorus and nitrogen are essential for plant growth and aquatic community health. However, in the lower Wenatchee River and Icicle Creek, too much phosphorus can cause excessive aquatic plant growth.

In streams affected by eutrophication, natural re-aeration processes cannot compensate for plant and bacterial respiration, and DO levels become too low at night. Additionally, hydrogen ion concentration (pH) becomes high at night and too low during the day. These 24-hour (day to night) swings in DO and pH can be harmful, and even fatal, to fish and aquatic insects. In addition, nutrients can create nuisance conditions in streams by choking streams with excessive plant and algae growth. These conditions may interfere with water intake structures, water conveyance in irrigation canals, and fishing, boating, and swimming.

Washington State water quality standards do not have numeric nutrient (nitrogen and phosphorus) criteria for streams. However, the 2003 standards [Chapter 173-201A-240 (1) WAC] contain a narrative criterion applicable to nutrients as toxic substances that states the following:

> *Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department.*

Target pollutant reductions may be expressed as loads, concentrations, or other appropriate measures [40 CFR 130.2(I)]. Limits on surrogates are allowed in TMDLs to prevent degradation of beneficial uses when a direct connection can be shown in the data. Nutrient load allocations are used in Wenatchee River TMDL since nutrients are identified as the primary controllable factor for the primary productivity affecting DO and pH in these stream segments.

The federal Clean Water Act Section 303(d)(1) requires that TMDLs "*be established at the level necessary to implement the applicable water quality standards with seasonal variations.*" The implementing regulations also state that determination of "*TMDLs shall take into account critical conditions for streamflow, loading, and water quality parameters*" [40 CFR 130.7(c)(1)].

The critical period in the Wenatchee River watershed occurs during March through May (prior to snow melt run-off) and July through October (after snow melt run-off). During these two periods, flows are low, and there is enough sunlight and warm enough water temperatures for algal (or biological) productivity.

The TMDL for phosphorus in the Wenatchee watershed is expressed as a daily maximum concentration for total phosphorus.

The wasteload allocations presented as a maximum daily concentration in Table 4-1 are provided to meet DO and pH criteria during the critical period established for this TMDL. The critical period occurs during March through May prior to snowmelt run-off and July through October after snowmelt run-off. Under existing conditions, the Leavenworth National Fish Hatchery has a wasteload allocation of 5.7 µg/L (see Table 4-1). Table 4-2 presents the wasteload allocation in kilograms per day.

Table 4-1 Total Phosphorus Maximum Daily Wasteload Allocation in Concentration	
Facility name & NPDES permit #	**Wasteload allocation**
Leavenworth National Fish Hatchery WA-000190-2	**5.7 µg/L**

Table 4-2
Total Phosphorus Wasteload Allocations in Loads

LNFH discharge point	2002 inorganic-P load	Target maximum load
Process water	1.191 kg/day	0.51 kg/day
Abatement pond	0.062 kg/day	0.008 kg/day
Total LNFH	1.25 kg/day	**0.52 kg/day**

Chapter 5 ANALYSIS OF EFFECTS

The ESA Section 7 implementing regulations (50 CFR 402.02) define "effects of the action" as:

> The direct and indirect effects of an action on the species or critical habitat together with the effects of other activities which are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02).

This BE concentrates on the protective measures afforded by the proposed permit. It is important to understand that the permit does not authorize noncompliance. Although it is possible that there may be situations where permittees are not in compliance with the permit, such situations are not authorized and not addressed in this BE. The analysis of effects in the BE assumes compliance with the proposed permit and examines what the likely effect on the species would be under that scenario. The effects section looks at direct and indirect effects from hatchery effluent that could affect water quality parameters including nutrients, pH, disease control chemicals, transport water and microbiological pollutants.

There are three possible determinations of effects under the ESA (USFWS and NMFS 1998). The determinations and their definitions are:

- **No Effect (NE)** - the appropriate conclusion when the action agency determines its proposed action will not affect listed species or critical habitat.
- **May affect, is not likely to adversely affect (NLAA)** - the appropriate conclusion when effects on listed species are expected to be discountable, or insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.
- **May affect, likely to adversely affect (LAA)** - the appropriate conclusion if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species, but also is likely to cause

some adverse effects, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal section 7 consultation.

For the purposes of Section 7 of the ESA, any action that is reasonably certain to result in "take" is likely to adversely affect a proposed or listed species. The ESA (Section 3) defines "take" as "to harass, harm, pursue, hunt, shoot, wound, trap, kill, capture, collect or attempt to engage in any such conduct." Further, the term "harass" is defined as "an intentional or negligent act that creates the likelihood of injuring wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns such as breeding, feeding, or sheltering" (50 CFR 17.3). NOAA Fisheries has interpreted "harm" as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, feeding, or sheltering" (64 FR 60727). The USFWS (1994) further defines "harm" as "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering."

5.1 DIRECT EFFECTS OF WATER QUALITY ON AQUATIC SPECIES

Reduced water quality is one of the factors of decline for the fish species under consideration in this BE. The proposed permit is expected to have a beneficial effect on water quality and thereby should also have a beneficial effect on listed fish species. Updated effluent limits for TSS and settleable solids will reduce loads of these constituents. A new limit for total phosphorus, based on the 2009 Wenatchee River TMDL, will lead to improved pH and dissolved oxygen levels in Icicle Creek during the critical periods of March through May and July through October. Effluent limits for chlorine will reduce load of this constituent if it is used at LNFH. The facility will be required to report disease chemical use to better determine potential levels in its effluent. It will also be required to implement a best management practices plan to prevent or minimize the discharges of pollutants. While water quality directly affects fish health and survival for the species under consideration, other factors, such as habitat loss, hydropower projects (dams), and over-harvesting, are also major contributors to species decline. For some species, predation by, competition with, and interbreeding with exotic species are also major contributors to species decline. A number of water quality parameters were analyzed individually to determine if there would be adverse effects to fish or other aquatic species.

5.1.1 Chlorine

Even with significant dilution by other flows within a hatchery, the USEPA Region 10 believes that if there is routine application of chlorine in fish hatcheries, there is potential for excursions above applicable numeric and narrative water quality for criteria for substances in receiving waters. The permit, therefore, includes an instantaneous maximum effluent limitation for total residual chlorine, which applies the State of Washington's water quality criteria (WAC 173-201A) at the point of discharge. Therefore, the discharge is not expected to adversely impact water quality in Icicle Creek. Derivations of the effluent limitations are provided in Appendix B of the attached fact sheet (Appendix B of this document). The effluent limits in the permit include the instantaneous maximum daily effluent limitation of 19 μg/L (0.019 mg/L) for total residual chlorine.

Total residual chlorine (TRC) can be a composite of free chlorine and chloramines. Mixtures with a chlorine component have caused sublethal effects (i.e., damage to gills and irritation of membranes), increased mortality and bioavailability of metals, and avoidance in fish. A number of studies have looked at effects of total residual chlorine and chloramines on fish species. The studies discussed below focus on studies on listed fish species for the Washington hatcheries permit or species that are closely related to those species which best inform the potential for effects to the listed species by total residual chlorine.

Anderson (1983) evaluated the mixture effects of nickel and TRC on mortality and bioaccumulation in rainbow trout. The 96 hr LC_{50} was set up with a factorial design to measure combinations of TRC and nickel at three different temperature regimes (8 °C, 12 °C and 16 °C) using a flow through system. In the Anderson (1983) study some nickel had to be present in the test solution in order for mortality to occur. For instance, in the absence of nickel, no mortality was observed at the highest TRC tested (0.044 mg/L). Metals are not expected to be discharged within the effluent of the facilities covered under this hatcheries permit. The limits in the permit for both freshwater and marine are at least two fold lower than the no observable effect concentration (NOEC) of 0.044 mg/L seen in the Anderson 1983 study.

Arthur et al. (1975) measured one hour to 7-day LC_{50} values in brook trout, coho salmon, fathead minnow, white sucker, walleye, yellow perch, largemouth bass and a number of invertebrates. The 7-day LC_{50} values in fish ranged from 0.082 to 0.261 mg/L. Ward et al. (1976) performed acute toxicity tests with fathead minnow, lake trout, goldfish, rainbow trout, coho salmon, largemouth bass, crappie and other species. The 96-hour LC_{50} values for the fish species ranged between 0.040 and 0.278 mg/L. Another study by Thatcher et al. (1976) exposed brook trout to TRC at concentrations between 7 and 20 °C. The mean LC_{50} value at 10 and 15 °C was about 0.15 mg/L while the mean LC_{50} value at 20 °C was approximately 0.10 mg/L. Larson et al. (1978) exposed several fish species to chloramines and TRC. 96-hr LC_{50} values for brook trout ranging in age from 8-60 weeks were 0.082 and 0.091 mg/L, respectively, showing no influence of age on sensitivity. In juvenile coho salmon, growth, food consumption or food-conversion efficiency at different feeding levels were not affected by exposure to TRC concentrations of 0.005 and 0.010 mg/L; however effects on these endpoints were seen at 0.020 mg/L. Total residual chlorine had no apparent effect on fertilization, embryo survival, time to hatching or alevin survival at TRC concentrations as high as 0.394 mg/L. Buckley (1976) exposed yearling coho salmon to levels of TRC in municipal sewage treatment effluent in seawater. TRC concentrations of 0.003-0.009 mg/L produced no discernable effects in the fish. Concentrations of 0.030 mg/L TRC resulted in hematological effects including anemia and cell lysis. The TRC limits in the permit for both freshwater and marine are lower than levels which led to effects in various salmonids in these studies.

Another potential indirect effect from TRC is fish avoidance behavior. The degree to which fish will avoid chlorine depends on a number of factors. Fish can detect and generally avoid chlorine, chloramines (CRC), and hypochlorus acid (HOCl). The levels at which fish avoid these compounds were evaluated by Cherry et al. (1979) for six fish species, including one salmonid, the coho salmon (*Oncorhynchus kisutch*). They found that avoidance of chlorine varied according to species, water temperature, and form of chlorine. Coho salmon showed sensitivity to TRC at 0.05 mg/L (12 °C), with the threshold for avoidance increasing at higher temperatures (up to 16 °C). As an acid, HOCl is considered a surface irritant and this irritation may be noticed sooner, causing fish to avoid the plume (Cherry et al. 1979). The avoidance threshold for HOCl in coho was lower than for TRC and ranged from 0.01 to 0.02 mg/L. It was clear from Cherry et al. (1979) that pH, ammonia, and water temperature influenced chlorine avoidance. Summer water temperatures increased the avoidance threshold in coho salmon. This is significant if fish are exposed to potentially lethal chlorine concentrations that are lower than the summer avoidance threshold. However, fish may not experience direct effects if they are able to detect chlorine and avoid the effluent plume. Permitted chlorine concentrations in the permit are lower than the range avoided by coho at a water temperature of 12 °C.

Based on this information, EPA has determined that discharges in compliance with the effluent limit for total residual chlorine in the LNFH permit are **not likely to adversely affect** listed fish species in Washington.

5.1.2 Total Suspended and Settleable Solids

EPA published no technology-based numeric effluent limitations for suspended and settleable solids when it promulgated its effluent limitations guidelines for concentrated aquatic animal production facilities in August 2004. The USEPA Region 10 has, therefore, used Best Professional Judgment to establish the limitations for suspended and settleable solids in the proposed permit.

Proposed numeric limitations for TSS and settleable solids are consistent with those in EPA's general permit for federal and tribal aquaculture facilities in Washington as well as with the State of Washington's effluent limitations for all upland hatcheries at WAC 173-221A-100 and with the State's general permit for upland finfish hatching and rearing facilities.

The effluent limit for TSS is 5 mg/L net TSS as an average monthly effluent limitation with a daily maximum limit of 15 mg/L. For discharges from the separate offline settling system and discharges from raceways and the adult pond that occur during fish release events, there is an instantaneous maximum limit of 100 mg/L and required removal rates of 85% for settleable solids and 90% for TSS.

Suspended solids are usually silt and clay particles that are between 2 and 60 microns (μm) in diameter. Suspended sediments can be directly measured as total suspended solids (TSS) in milligrams per liter (mg/L) but are frequently measured indirectly in surface waters as turbidity. Elevated TSS conditions in surface waters have been reported to enhance cover conditions and reduce piscivorous fish and bird predation risks. Elevated TSS conditions have also been reported to cause physiological stresses, reduce growth, and adversely affect survival. Servizi and Martens (1992) noted a threshold for the onset of avoidance by fish at 300 mg/L TSS. Behavioral effects including "gill flaring" and "coughing" responses increase in frequency at higher suspended sediment at 230 mg/L TSS (Servizi and Martens 1992). Turbidities greater than 2,000 to 3,000 mg/L suspended sediment concentrations can decrease the visual acuity of predatory fish, leading to reduced feeding rates (McLeay et al. 1984, 1987; Redding et al. 1987; Reynolds et al. 1989) and reduced growth (Sigler 1984). In a laboratory experiment, juvenile coho salmon and steelhead were subjected to 2000 to 4000 mg/L of suspended sediment for several days, showing an immediate increase in stress, then within 5 days of initial exposure, returning to control stress levels (Redding et al. 1987). Mortality related to TSS in salmonids depends on several factors, such as life stage, particle size, and water temperature. Significant mortality (>50 percent) usually occurs at suspended sediment concentrations in the range of 500 to 6,000 mg/L (Lloyd 1987; Sigler et al. 1984). Older, larger salmonids are generally more tolerant of high suspended sediment concentrations (200 to 20,000 mg/L) than juvenile salmonids, eggs, and larvae (Sigler et al. 1984). However, turbid water can be beneficial in somewhat low concentrations and act as cover to protect fish from predation. Fish that remain in turbid water experience a reduction in predation from piscivorous fish and birds (Gregory and Levings 1998).

The predicted threshold for sublethal effects to juvenile and adult salmonids consists of the following suspended sediment/exposure duration relationships: 55 mg/L for 1 hour; 7 mg/L for 7 hours; 3 mg/L for 1 day and 2 days; and 1 mg/L for exposures of 6 days or longer (Newcombe and Jensen 1996). In general, a limit of 25 mg/L of suspended sediment provides a high level of protection of aquatic organisms; 80 mg/L provides moderate protection; and >400 mg/L provides low to very low protection (Thurston et al. 1979; USDAFS 1990). Based on the above information, discharges from LNFH at the levels of the TSS and settleable solids limits included in the permit should have insignificant and discountable effects on listed fish species. Furthermore, in its 2003 Biological Opinion on federal hatchery operations in the upper Columbia River basin, NMFS believed that programs operated in compliance with NPDES permits sufficiently minimize the likelihood for adverse effects on downstream aquatic life, including listed fish (NMFS, 2003). Therefore, TSS and settleable solids are **not likely to adversely affect** listed fish species.

5.1.3 Nutrients

5.1.3.1 Nitrogen

The State of Washington has established water quality criteria for nutrients (nitrogen and phosphorus) in lakes (water bodies with a mean detention time of greater than 15 days) but not for streams, and it has established water quality criteria for ammonia as a toxic in all surface waters at WAC 173-201A-240. The Effluent Limitations Guidelines for Concentrated Aquatic Animal Production Point Source Category [69 FR 162 (Aug. 23, 2004)] state that control of suspended solids will incidentally control concentrations of other pollutants of concern, including biochemical oxygen demand (BOD) and nutrients, because other pollutants are either bound to the solids or are incorporated into them. Based on this information it is not expected that this facility will discharge large amounts of nutrients. Additionally, the USEPA also believes that implementation of best management practices to minimize the discharge of excess feed will assist in limiting nutrient residuals in discharges.

5.1.3.2 Phosphorus

The 2008 Water Quality Assessment for the State of Washington listed lower Icicle Creek in the vicinity of the LNFH outfall as impaired for pH, dissolved oxygen (DO), and PCBs. In water quality assessments beginning in 2002, Ecology studied the contributing factors to the impairment of DO and pH in the watershed. It determined that phosphorus discharges from point and non-point sources contributed significantly to the impairment of both parameters. Ecology developed and, on August 26, 2009, EPA approved the *Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load—Water Quality Improvement Report,* which included both mass and concentration wasteload allocations for total phosphorus for the LNFH discharge to Icicle Creek.

Based on this information, it was determined that nutrients will result in insignificant and discountable effects to the listed species and therefore are **not likely to adversely affect** any of the listed fish species

5.1.4 Drugs, Disinfectants, and Other Chemicals

There are no applicable technology-based limitations or effluent guidelines in place for drugs, disinfectants, and other chemicals used within the hatchery industry. Furthermore, State water quality criteria do not specifically limit residuals of these materials in discharges from hatchery facilities. State water quality criteria include narrative criteria, which prohibit levels of toxic substances in concentrations that impair beneficial uses of receiving waters.

Chemicals in discharges from aquaculture facilities may include therapeutic agents to treat sick fish and water treatment chemicals used for water quality management. These therapeutic agents are either approved by the US Food and Drug Administration (FDA) for treating sick fish, are part of FDA monitored Investigative New Animal Drug (INAD) exemptions, or are chemicals on which the FDA has deferred regulatory action, pending their review. Some water quality management chemicals also have therapeutic properties. Hatchery chemicals used for the treatment of disease can include potassium permanganate, oxytetracycline, hydrogen peroxide, formalin and chloramine-T. However, for federal hatcheries in Washington, the most common used chemicals are chloramine-T and hydrogen peroxide (pers. comm., B. Stewart, 2008).

In order to estimate effects on aquatic organisms from these chemicals, USEPA Region 10 (Region 10) used information provided in the BE for the 2007 general permits for Aquaculture Facilities in Idaho (USEPA, 2007). In the 1999 Idaho aquaculture general permit, Region 10 required large facilities to submit to EPA monthly information regarding disease control chemicals used at the facilities including frequency, timing, and type of chemical used. The estimated average effluent concentration was determined based on recorded usage amounts and estimated water flows from hatchery facilities similar to those in Washington. The final effluent concentration was then compared to available toxicity data for aquatic organisms in the literature to determine the likelihood of adverse effects in listed species from the effluent levels of the disease control chemicals. The following summaries and conclusions were based on this analysis, since facilities in Washington are likely to use similar amounts of chemicals and have similar water flows.

5.1.4.1 Potassium Permanganate

Potassium permanganate is used for water quality management in drinking water and aquaculture facilities to oxidize organic matter. Because of its brief oxidizing action in waters used in fish hatcheries it is also used to treat and/or prevent common opportunistic external fish diseases such as those caused by gill parasites, external gill bacteria or external fungal infestations. Common treatment rates are based on the organic load of the fish rearing waters that are often quantified by the 15-minute potassium permanganate demand (PPD). In waters with limited organic matter or PPD the treatment rate is about 2 mg/L for an indefinite period or 20-30 minute raceway application. Rarely has it been used at higher doses, although some literature suggests a tank treatment of 10 mg/L for 10 min is possible. In water containing organic matter, potassium permanganate's oxidizing activity is rapidly used, leaving manganese dioxide (MnO2). Manganese dioxide is non-soluble in water and relatively nontoxic, particularly at the concentrations likely to be encountered following use in aquaculture facilities.

Based on data collected from a number of large aquaculture facilities in Idaho, treatment concentrations of 1.7 mg/L would be estimated to result in effluent concentrations of 0.5 mg/L or less, depending on the extent of dilution with untreated aquaculture waters, amount of organic matter present and the duration of treatment. Scientific literature indicates the toxicity levels to aquatic organisms can vary significantly (Hobbs et al., 2003). Atlantic salmon fry display a 24 hr LC_{50} value of 1.41mg/L, while Giant River prawn, shrimp and mussels demonstrate LC_{50} values of 1.14, 180 and 40 mg/L, respectively. Acute toxicity tests using synthetic moderately hard clean water (70 mg/L alkalinity and 100 mg/L total hardness) with little or no organic matter show static 96 hr mean LC_{50} values ($\pm$SD) of 0.058 ± 0.006

mg/L for *Ceriodaphnia dubia*, 0.053 ± 0.009 mg/L for *Daphnia magna*, 2.13 ± 0.07 mg/L for *Pimephales promelas*, 4.74 ±1.05 mg/L for *Hyalella azteca* and 4.43 ± 0.79 mg/L for *Chironomus tentans* (Hobbs et al., 2003). In these studies, potassium permanganate was dosed a single time at the initiation of the 96 hr time period. The toxicities were significantly reduced in similar laboratory tests using pond water (195 mg/L alkalinity and 100 mg/L total hardness and containing organic matter) with static 96 hr mean LC_{50} values (± SD) of 2.39 ± 0.36 mg/L for *Ceriodaphnia dubia*, 1.98 ± 0.12 mg/L for *Daphnia magna*, 11.22 ± 1.07 mg/L for *Pimephales promelas*, 13.55 ± 2.24 for *Hyalella azteca* and 12.30 ± 2.83 mg/L for *Chironomus tentans* (Hobbs et al., 2003). Chronic toxicity test results using reconstituted moderately hard clean water show static LC_{50} values of 0.12 mg/L (*Ceriodaphnia dubia*), 0.49 mg/L (*Daphnia magna*), 2.15 mg/L (*Pimephales promelas*).

Potassium permanganate is rapidly exhausted due to the oxidizing properties of potassium permanganate in receiving waters. In addition, at estimated aquaculture effluent concentrations of 0.5 mg/L or less, potassium permanganate would be below acute effect concentrations for aquatic organisms. Concentrations of potassium permanganate in the effluent would result in insignificant and discountable effects to the listed species in the permit. Therefore, potassium permanganate is **not likely to adversely affect** aquatic organisms in surface waters.

5.1.4.2 Oxytetracycline

Oxytetracycline (OTC) is a broad spectrum FDA-approved antimicrobial used to treat certain bacterial infections in rainbow trout held in aquaculture facilities. The FDA-labeled dose for rainbow trout is 2.5-3.75 g per 100 lb of fish per day, administered in feed for 7 to 10 days. Using average reported treatment concentrations from aquaculture facilities in Idaho as well as reported effluent flows for the facilities, an estimated effluent concentration of 0.003 mg/L OTC was determined, with a worst-case scenario effluent concentration of 0.3 mg/L OTC. The estimated effluent concentration of OTC is significantly lower than any toxicity endpoints for freshwater or marine organisms with the lowest LC_{50} value at 0.16 mg/L for marine shrimp.

Another concern regarding OTC treatment at aquaculture facilities is the development of OTC bacterial resistance following OTC treatment. Herwig et al. (1997) found background concentrations of resistant bacteria of 1 to 4% at sites in sediment of aquaculture facilities before OTC was used and an increase to 3 to 9% resistant bacteria following OTC treatment. The percentage of bacterial resistance in the sediment increased with increasing OTC concentrations. Oxytetracycline is thought to adsorb strongly to sediments and following administration of 20 kg OTC per cage, OTC could be detected 30 m but not 100 m down-current from marine net-pen aquaculture facilities (Weston et al, 1994). Coyne et al. (1994) and Kerry et al. (1996) found that the sediment area in aquaculture facilities subject to OTC deposition following treatment was no greater than twice the area of the cages. The numbers of OTC resistant bacteria also decline an order of magnitude with a distance of 200 m from the net-pen (Herwig et al., 1997). Levels of resistant bacteria quickly return to background levels. Even with an OTC sediment concentration of 11 mg/kg OTC, bacterial resistance in sediment was indistinguishable from background after 73 days (Kerry et al., 1994). DePaola et al. (1995) found that resistance of intestinal and aquatic bacteria returned to pretreatment levels within 21 days after treatment. Several studies have determined that the presence of OTC is not a required condition for increase in OTC resistance (McPhearson et al., 1991; Vaughn et al., 1996; Kerry et al., 1995) and one study found no correlation between concentration of OTC in a sediment sample and frequency of resistance in culturable microflora (Kerry et al., 1996). Additionally, Kapetanaki et al. (1995) analyzed marine sediments in tanks free of OTC in which they administered sterile fish feed. They found that in tanks with large amounts of feed, levels of OTC resistant bacteria rose dramatically by 70 days.

In conclusion, effluent concentrations are below toxicity endpoints for most aquatic organisms; the development of resistance following OTC administration may be due to factors other than OTC administration; and OTC resistance in sediments rapidly dissipates to pretreatment levels. In addition, OTC is not one of the treatment chemicals typically used in federal hatcheries in Washington. Therefore, OTC is **not likely to adversely affect** aquatic organisms.

5.1.4.3 Hydrogen Peroxide

Hydrogen peroxide (H_2O_2) may be used in aquaculture facilities as a waterborne therapeutant in intensive aquaculture operations for the control of mortalities associated with external saprolegniasis on the eggs of all cultured freshwater fish, the control of mortalities associated with bacterial gill disease on all freshwater-reared salmonids, and the control of mortalities associated with external columnaris disease in all freshwater-reared cool water finfish and channel catfish. The concentration of hydrogen peroxide used by the facility and length of treatment depends on the reason it is being administered. For example, a high concentration used is once daily on consecutive or alternate days for 15 min as a flowing treatment at concentrations from 500 to 1,000 mg/L for treatment of freshwater-reared finfish eggs.

The USGS prepared an Environmental Assessment for the Use of Hydrogen Peroxide in Aquaculture for Treating External Fungal and Bacterial Diseases of Cultured Fish and Fish Eggs (Schmidt et al. 2006). This document has a more in depth discussion of potential effects to aquatic ecosystems from hydrogen peroxide, however, a portion of the effects data is summarized as follows. Gannon and Gannon (1975) found that *Daphnia pulex* could be immobilized by exposures of 3,000 mg/L H_20_2 for 5 min. Shurtleff (1989) calculated a 48-h LC_{50} value (the lethal concentration to 50% of test organisms after 48 h exposure) of 2.4 mg/L for *Daphnia pulex* exposed to H_20_2. The sensitivity of a similar but larger daphnid, *Daphnia magna,* was determined by Bringmann and Kuehn (1982). They determined the 24-h ECo, EC_{50}, and EC_{100} values for immobilization after 24-h exposures to be 3.8, 7.7, and 15 mg/L, respectively. *Gammarus* spp. were found to be moderately sensitive to H_20_2 (Kay et al. 1982), with an estimated 96-h LC_{50} value of 4.42 mg/L. A 21-d chronic study of H_20_2 toxicity to *Daphnia magna* was conducted at flow-through conditions with nominal exposure concentrations of 0, 0.32, 0.63, 1.25, 2.5 and 5.0 mg/L. Concentrations greater than or equal to 0.32 mg/L reduced daphnia growth relative to untreated controls (Meinertz, et al. 2008. Rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), and lake trout (*Salvelinus namaycush*) fingerlings showed no mortality at exposure concentrations of 283, 283, and 1,132 mg/L, respectively, after 45-min exposures, every other day, for four consecutive treatments (Rach et al. 1997). Rach et al. (1997) also conducted tests on the same species of fish using 15-min exposures, for which the NOEC values for mortality were approximately 2 to 3 times as great (1,232 to 3,396 mg/L). Gaikowski et al. (1999) found that the freshwater species tested--rainbow trout, lake trout, Atlantic salmon (*Salmo salar*), and largemouth bass (*Micropterus salmoides*)--could be safely treated for 60 min at exposure concentrations as high as 150 mg/L without mortality occurring. McKee and Wolf (1963) reported that 48-h exposures of greater than 40 mg/L caused mortality in rainbow trout. Arndt and Wagner (1997) estimated that the 1-hr LC_{50} values for rainbow trout fry and fingerlings were 322 and 329 mg/I,, respectively, at 15°C. They also conducted similar tests with cutthroat trout (*Oncorhynchus clarki*) and estimated that the 1-h LC_{50} values at 15 °C for fry and fingerlings were 377 and 506 mg/L, respectively. Speare and Arsenault (1997) reported that twice-weekly H_20_2 treatments of 200 mg/L for 60 min administered to juvenile (6.2 g) rainbow trout over seven weeks caused no change in fish weight or gill histology compared to untreated controls. Based on an assessment of the toxicity data, an acute benchmark for hydrogen peroxide was calculated as 0.7 mg/L (Schmidt et al. 2006).

Hydrogen peroxide is a naturally occurring substance in almost all surface waters. The formation of hydrogen peroxide results primarily from ultraviolet light reacting with humic substances (dissolved organic carbon) in water. The concentrations of hydrogen peroxide occurring naturally in freshwater range from 0.001 to 0.109 mg/L (Schmidt et al. 2006). Aquaculture facilities dilute the hydrogen peroxide by 2 to 100,000 fold before discharging into surface waters. In addition, hydrogen peroxide naturally degrades to water and oxygen by various mechanisms, including chemical reduction and enzymatic (catalase and peroxidase) decomposition by algae, zooplankton, and heterotrophic bacteria. The half-life of hydrogen peroxide ranges from several hours to several days or more, depending on the characteristics of receiving water (Herut et al. 1998). Longer half-lives occur in pristine, oligotrophic water with very few microorganisms, algae, and organic matter. Much shorter half-lives occur in nutrient-rich eutrophic water containing a larger biomass of microorganisms. Even at concentrations above those occurring naturally in fresh water, decay can be rapid in surface water. Kay et al. (1984) observed that in culture water containing freshwater algae *(Raphidiopsis spp)*, 94% of an initial 4.7 mg/L H_20_2treatment disappeared within 4 h after treatment. Because H_20_2 undergoes rapid degradation in eutrophic waters, most freshwater facilities with large holding ponds will probably discharge H_20_2 at concentrations far below the proposed 0.7 mg/L acute benchmark (Schmidt et al. 2006). Therefore, EPA has determined that hydrogen peroxide concentrations in the effluent of the aquaculture facilities are **not likely to adversely affect** aquatic organisms.

5.1.4.4 Formalin

Formalin is used as a bath treatment in aquaculture to control external parasitic infestations of fish. It is approved by the US FDA as an external parasiticide. Formalin (100 %) is described as a solution of 37% formaldehyde gas dissolved in water. Solutions of formalin contain 10 to 15% methanol to prevent formation of paraformaldehyde, which is a toxic byproduct. Concentrations of formalin used in the aquaculture industry vary depending on the length of exposure. For prolonged exposures, concentrations of 25 mg/L are used, but concentrations of up to 250 mg/L can be used for up to one hour. Looking at data provided from aquaculture facilities in Idaho, average treatment concentrations for formalin were 250 mg/L with average effluent concentrations of 0.681 mg/L. Reviewing the available data in salmon species, the 24-hour LC_{50} value in lake trout ranges from 45.6 mg/L (Bills et al. 1977) to 200 mg/L (Wilford 1966). 24-hour LC50 values in rainbow trout range from 54-250 mg/L (Howe 1995, Bills 1981). A LOEC value for rainbow trout was 150 mg/L following a 40 minute exposure (Baldwin et al. 1994). Information from the Fish and Wildlife Service demonstrated 24-hr LC_{50} values for formalin at 710 mg/L in snails (*Helisoma* sp), 389 mg/L in Atlantic salmon, 300 mg/L in rainbow trout, and 211 mg/L in bluegill (USFWS, 1981).

Based on the available data, the toxicity values seen for both fish and snails (59 to 700 mg/L) is three orders of magnitude greater than the concentration typically measured in effluent of aquaculture facilities using formalin (0.681 mg/L). Therefore, estimated concentrations of formalin in the effluent of the facility are **not likely to adversely affect** aquatic organisms.

5.1.4.5 Chloramine-T

Chloramine-T is a chlorine-based chemical for treatment of bacterial gill disease, usually used as a bath or flush treatment at concentrations of 2.5 mg/L (pH=6) to 20 mg/L (pH=8) for one hour. Chloramine-T is used under an FDA INAD exemption. Based on aquaculture facilities in Idaho that reported chloramine-T use, the median typical Environmental Introduction Concentration (EIC) was estimated to be 1.1 mg/L with a median maximum EIC estimated at 1.7 mg/L (Schmidt et al. 2002). EPA also estimated effluent concentrations based on chemical usage data and flow rates from similar aquaculture facilities in Idaho (USEPA 2007), the highest effluent concentration for chloramine-T was 3.07 mg/L.

Following discharge, chloramine-T is naturally dechlorinated to para-toluenesulfonamide (p-TSA) and other chlorinated organic compounds. Degradation by chemical mechanisms to these stable chlorinated organics, however, produces only trace concentrations of these compounds below the level of detection (Schmidt et al. 2002). The toxicity level for chloramine-T is significantly higher than concentrations that would be found in effluent from aquaculture facilities. In catfish, the 60 min LC_{50} value is 60 mg/L and the 96-hour LC50 value is 3.75 mg/L (Bills et al. 1988). The 1 hour LC_{50} value for striped bass fry is approximately 80 mg/L, the mean 24 hr LC_{50} value was 14.1 mg/L and the mean 96 hr LC50 value was 6.65 mg/L (Bills et al. 1993). In addition, Sanchez et al. (1997) exposed juvenile rainbow trout to 10 mg/L chloramine-T one hour once per week for four weeks. The study concluded that intermittent exposure to choramine-T at 10 mg/L does not elicit primary or secondary stress response in rainbow trout. Recently it was shown that acute exposure of rainbow trout to 9 mg/L chloramine-T resulted in transient respiratory and metabolic disturbances in acid-base status of the fish, which rapidly corrected once the chloramine-T was removed (Powell and Perry 1996). Based on estimates of effluent concentrations from Idaho aquaculture facilities, the effluent concentration is below the toxic levels for aquatic species indicated in available data. Additional information regarding concentrations of chloramine-T in the LNFH effluent will be required in this permit.

Based on the fact that estimated effluent concentrations are below toxicity levels and chloramine-T is degraded following discharge, chloramine-T should result in insignificant effects to listed species and is **not likely to adversely affect** aquatic organisms.

5.1.4.6 Florfenicol

Florfenicol is the active ingredient in Aquaflor ®, a broad-spectrum antibiotic used against a wide range of fish pathogens. Treatment is administered at a dose rate of 10 mg/kg body weight daily for 10 days in feed, which is formulated as floating extruded pellets with high water stability, so virtually all of the dispensed feed is consumed by fish with little reaching the sediments. Florfenicol has a half-life of approximately 30 days. The K_{oc} for florfenicol is 10-27, the low K_{oc} value indicates that it will preferentially stay in the water column rather than in sediment or suspended particles and would be considered highly mobile in soils and sediment. Florfenicol and its metabolites enter the sediment via excreta with the compounds moving into the water column through leaching from feces. Florfenicol has a log K_{ow} value of 0.37, which indicates this compound has little potential for bioaccumulation or biomagnifications through the food chain.

An environmental assessment (Shering-Plough Animal Health 2004) estimated a predicted environmental concentration (PEC) based on various scenarios of a fish hatchery facility. The first scenario is a fingerling pond, and assuming production of 27,000 kg of fish with 10 mg/kg fish for 10 days (total of

100 mg/kg fish) results in a load of 2,700,000 mg of florfenicol. Assuming a pond with a effluent flow of 40,468,600 liters of water in 10 days results in an effluent concentration of 0.067 mg/L of florfenicol. The preliminary PEC_{water} represents a peak worst-case concentration of florfenicol residues in fingerling pond water. This assumes 100% of the florfenicol residues are in the water column, none partitioned to the sediment, and none remains in the fish at 12 days posttreatment. A water concentration of 0.067 mg/L degrading with a 30-day half-life for a 42-day period of time yields an estimated concentration of 0.0268 mg/L. If this is then diluted 1:10 into receiving waters, then the refined PEC_{water} is 0.00268 mg/L. A refined PEC_{water} was also calculated for a levee type production pond at 0.0104 mg/L.

Toxicity data for a number of aquatic species is provided in Table 5-1 below.

Table 5-1: Predicted No-effect Florfenicol Concentrations (PNECs) for Aquatic Organisms

Organism	EC_{50}/LC_{50} mg/L	NOEC mg/L	Application Factor	PNEC mg/L
Oncorhynchus mykiss	>780	780	100	7.8[a]
Lepomis macrochirus	>830	830	100	8.3[a]
Daphnia magna	>330	<100	100	1.0[a]
Litopenaeus vannamei	>64	4	10	0.4[b]
Kelenastrum capricornutum	1.5	0.75	10	0.075[b]
Skeletonema costatum	0.0128	0.0042	10	0.0042[b]
Bacillus subtilis	0.4 µg/L[c]		10	0.04[b]

[a]An application factor of 10 was used to account for intraspecies variation and a factor of 10 was used in an extrapolation from acute to chronic data.
[b]An application factor of 10 was used to account for intraspecies variation. These values already represent chronic end points.
[c] minimum inhibitory concentration

With the exception of *Skeletonema costatum*, all of the toxicity values were significantly higher than the predicted environmental concentration of florfenicol following treatment of fish. The predicted environmental concentrations of florfenicol were worst-case scenarios and the concentrations in effluent are likely to be lower than those values estimated above.

Therefore, it is expected that levels of florfenicol in effluent following treatment of fish in LNFH will have insignificant and discountable effects on aquatic organisms. Therefore, florfenicol is **not likely to adversely affect** the listed species.

5.1.4.7 Romet

Romet is an antibiotic used to medicate feed for the prevention and therapy of certain infectious salmonid diseases. Romet is used by coating pelleted food with the drug or including the drug in the mash before pelletization. Fish will consume the food and although the drug is not water soluble, a small percentage of the drug will be released into the water from fecal material of the treated fish. The continuous use of feed medicated with Romet for salmonids is approved at 50 mg/kg for five days. The active medication in Romet is a 5:l mixture of sulfadimethoxine (5 parts) and the potentiator ormethoprim (1 part).

An environmental assessment (Hoffman-LaRoche, Inc., 1984) was performed to determine the concentration of Romet following treatment of three-inch or nine-inch fish in a 540 cubic foot raceway. For the treatment of the three-inch salmonids, it was determined that approximately 367 pounds of fish were treated per raceway; the raceway contained 917,280 liters per day of water. This resulted in a predicted environmental concentration of 0.02 mg/L Romet. For the treatment of nine-inch salmonids, it was determined that approximately 2340 pounds of fish were treated per raceway; the raceway contained 917,280 liters per day of water. This resulted in a predicted environmental concentration of 0.06 mg/L Romet. Since LNFH produces about 90,000 pounds (27,320 kg) of fish per year, this was multiplied by the treatment concentration of 50 mg/kg for a total concentration of 453,550 mg of Romet per year. This concentration was divided by an estimate of the flow of water in the facility of 917,280 L per day times 365 days per year. This calculation resulted in the predicted environmental concentration of 0.001 mg/L. In addition, since most of the dose would be absorbed by the fish and slowly released over time, the actual concentration of Romet in the water is likely to be considerably lower.

A raceway study was performed at the National Fish Health Research Lab to mimic the worst case scenario described above. The concentrations of sulfadimethoxine and ormethoprim were measured in the raceways during and following the treatments. 30 out of 43 samples had sulfadimethoxine levels below 0.005 mg/L with the highest sample reaching 0.025 mg/L. 42 of the 43 water samples measured levels of ormethoprim below 0.005 mg/L with one sample reaching 0.006 mg/L.

The water flea is the most sensitive species to Romet with 48-hour LC50 values for sulfadimethoxine and ormethoprim at 53 mg/L (95% CI = 26-105 mg/L) and 33 mg/L (95% CI = 18-60 mg/L), respectively (Hoffman-LaRoche, Inc., 1984) 96-hour LC50 values for rainbow trout and channel catfish range from 400-600 mg/L Romet (Hoffman-LaRoche, Inc., 1984) The toxicity values for Romet are significantly higher than the predicted environmental concentrations of Romet. The predicted environmental concentrations were worst-case scenarios and the concentrations in effluent are likely to be lower than those estimated above.

Therefore, it is expected that levels of Romet in effluent following treatment of fish in the hatcheries will have insignificant and discountable effects on aquatic organisms. Therefore, Romet is **not likely to adversely affect** listed species.

5.1.4.8 Erythromycin

Erythromycin is the antibiotic currently used in the treatment against gram-positive bacteria such as those causing lactococcosis; it is also efficaciously used against bacterial kidney disease (BKD), a systemic infection causing serious mortality in lake trout and Pacific and Atlantic salmon. However, erythromycin can only be administered through veterinary extra-label uses, as it is not yet registered for its use in aquaculture. Erythromycin treatment occurs in feed at 100 mg/kg up to 28 days or injection of 20 mg/kg in fish.

An environmental assessment of erythromycin has not been completed; however, the same methodology as Romet was used to predict an environmental concentration following treatment of fish. The dose of

100 mg/kg erythromycin was multiplied by 9071 kg of fish/year and divided by the estimated flow of the facilities of 334,807,200 L/year. This resulted in a predicted environmental concentration of 0.003 mg/L. In addition, since most of the dose would be absorbed by the fish and slowly released over time, the actual concentration of erythromycin in the water is likely to be considerably lower.

Toxicity data was gathered using the ECOTOX database (USEPA 2009b. For whiteleg shrimp, the lowest NOEC value available was 4.9 mg/L, the lowest LOEC value was 15.1 mg/L and the lowest LC50 value was 30.8 mg/L. The lowest LC50 value for striped bass was 349 mg/L, similar to LC50 values for daphnia magna. The 6 hr. LC50 and 1 day LC50 values for erythromycin in lake trout were 800 and 818 mg/L, respectively (Marking 1988). The toxicity values for erythromycin are significantly higher than the predicted environmental concentrations of erythromycin.

Therefore, based on the information above it is expected that levels of erythromycin in effluent following treatment of fish in the hatcheries will have insignificant and discountable effects on aquatic organisms. Therefore, erythromycin is **not likely to adversely affect** listed species.

5.1.4.9 Sodium chloride

Sodium chloride is used by aquaculture facilities in one of two solutions. The FDA recommends a 0.5-1.0 percent solution of sodium chloride to be used for an indefinite period of time as an osmoregulatory aid to relieve stress and prevent shock, while use as a parasiticide requires a 3.0 percent solution for 10-30 minutes. Sodium chloride has been categorized by the FDA as a low regulatory priority when it is used according to indications identified by FDA specifications, at the dosages identified in FDA specifications, used according to good management practices, is of appropriate grade for use in food animals, and is not likely to result in an adverse effect on the environment.

Effluent concentrations of sodium chloride in aquaculture facilities can vary. Data provided by aquaculture facilities demonstrates that average effluent concentrations of sodium chloride can range as high as 104,000 ppb to 246,000 ppb. There is a sufficient amount of data that demonstrates that fish and snails are relatively resistant to the toxicity of sodium chloride.

There were no toxicity studies for salmon but numerous studies for rainbow trout show that they are similarly resistant to the toxicity of sodium chloride. Spehar (1986) demonstrated a 56-day NOEC and lowest observable effect concentration (LOEC) in rainbow trout eggs at 955,000 ppb and 1,924,000 ppb, respectively. The 56-day maximum acceptable toxicant concentration (MATC) value for rainbow trout eggs was 1,356,000 ppb (Spehar, 1986). The 96-hour LC_{50} value in both rainbow trout eggs and juveniles was 7,461,000 ppb (Spehar 1986, 1987). The 56-day LOEC for survival of fertilized eggs in rainbow trout exposed to sodium chloride was 2,740,000 ppb, and the 56-day NOEC for survival of rainbow trout fertilized eggs was 1,324,000 ppb (Spehar 1987). A two week study looking at hatchability in rainbow trout eggs demonstrated mortality at 15,000,000 to 30,000,000 ppb (Marking 1994).

Toxicity levels of sodium chloride are significantly higher than concentrations seen in the effluent of aquaculture facilities. Sodium chloride concentrations in the effluent of the LNFH should result in insignificant and discountable effects to the listed species. Therefore, EPA has determined that sodium chloride is **not likely to adversely affect** listed species.

5.1.4.10 Low Regulatory Priority Compounds

Low regulatory priority compounds include the following: acetic acid, calcium chloride, calcium oxide, carbon dioxide gas, fuller's earth, garlic, ice, magnesium sulfate, onion, papain, potassium chloride, povidone iodine, sodium bicarbonate, sodium chloride, sodium sulfite, thiamine hydrochloride and tannic acid or urea. Our information indicates that Washington hatcheries use only the following compounds: carbon dioxide gas, magnesium sulfate, povidone iodine, sodium bicarbonate and sodium chloride (pers. Communication w/ Bruce Stewart NWIFC and Ray Brunson FWS Fish Health Center 3/12/2009). Carbon dioxide gas is used approximately four times a year in small amounts in contained tanks, and the carbon dioxide gas bubbles out into the atmosphere. Magnesium sulfate is used occasionally (once per year) as a solution on the surface of the feed to treat intestinal parasites. Povidone iodine is used occasionally in low concentrations in small containers on eggs. Sodium bicarbonate is used at low doses in small containers to rinse eggs. Sodium chloride, discussed in more detail above, is occasionally used in transport of the fish. Since these chemicals are used in rare cases in small quantities and usually outside of the raceways, effluent concentrations are expected to be minimal and infrequent, and these low regulatory priority compounds used by LNFH should result in insignificant and discountable effects to the listed species. Therefore, EPA has determined that these compounds are **not likely to adversely affect** listed species.

5.1.4.11 Summary of Toxicity from Disease Control and Other Chemicals

In writing the general permit for aquaculture facilities in Idaho, USEPA Region 10 assessed whether the drugs, disinfectants and other chemicals used in fish hatcheries could lead to adverse effects in listed species. The USEPA acknowledged that literature suggested some significant risks associated with the discharge of residual disease-control drugs and other chemicals. However, at the effluent concentrations estimated, based on application quantities and estimated water flows from similar aquaculture facilities in Idaho, these estimated discharge concentrations are below toxicity levels for most aquatic organisms for which data was available. Because very little effluent data for these substances were available at that time, because analytical methods for their detection and measurement were very difficult at best, and because normal operating procedures provided maximum dilution of immersive treatments in facility discharges, the USEPA did not include specific effluent limitations for these substances in the general permit. In addition, most of the disease controlling chemicals listed above are not typically used in federal hatcheries in Washington.

In its Biological Opinion for the Operation and Maintenance of Leavenworth National Fish Hatchery through 2011, USFWS (2006) found that antibiotics, formalin and other chemicals used in fish culture at LNFH are administered in accordance with pertinent F DA and EPA regulations. Use of approved chemicals is not expected to cause toxicity in receiving waters when applied according to directions (Ecology 1989).

Based on this information, it was determined that discharge concentrations of disease controlling chemicals are **not likely to adversely affect** any of the listed fish species.

Annual record keeping requirements in the permits include information on chemical usage (frequency, timing, and type of chemical used). These data will be used to determine whether further testing and/or limits are needed in the next permit cycle. The permits may be modified prior to reissuance of the next permits to incorporate testing and/or limits, if necessary.

In the Effluent Limitations Guidelines for the CAAP industry at 40 CFR §451, the USEPA also did not include limitations for drugs, disinfectants, and other chemicals, citing the relative absence of data on their use. The Effluent Limitations Guidelines, like the general permit for Idaho aquaculture facilities, require some reporting on the use of drugs, disinfectants, and other chemicals in authorized discharges.

In the LNFH permit, except for chlorine, the USEPA Region 10 is not including water quality-based effluent limitations (WQBELs) for drugs, disinfectants, and other chemicals that are potentially applied within the facility. Few data are available regarding the use of these materials, and the USEPA Region 10 believes that implementation of best management practices will adequately control effluent levels of these materials. The requirements for Annual Production and Discharge Reports will enable the USEPA to reassess the potential for harm attributable to these materials in the future; and in the meantime, the USEPA may require whole effluent toxicity testing if the analysis shows reasonable potential to cause or contribute to an in-stream excursion above applicable water quality criteria for toxic substances.

5.1.5 Polychlorinated Biphenyls

Ecology has identified that PCBs were present in the tissue of fish from the Wenatchee River and Icicle Creek. The USFWS subsequently conducted an evaluation (Leavenworth National Fish Hatchery PCB and Pesticide Investigation, November 22, 2005) to determine if there were PCB sources within the hatchery that were being discharged in the hatchery effluent. This evaluation determined there was no statistical difference between PCB concentrations in stream sediment upstream and downstream of the hatchery discharge. The study also stated that "[t]he source of PCB in the hatchery settling pond is likely from hatchery fish food since most fish food contains ocean by-catch fish as a protein source in the food (Meador, 2002). Paint used in raceways at the Hatchery contained Aroclor 1254 (David Schneider letter and analysis report to Dan Davies, December 10, 2004), but the only detected Aroclors in hatchery settling pond sediment were Aroclor 1242 and 1260. The source of PCB contamination in the hatchery settling pond is not likely from PCB-contaminated paint. The level of PCB contamination in fish food appears to be declining over the past two decades (Meador, 2002), and Ecology did not find detectable PCB in the batch of fish food analyzed in their investigation (Schneider, 2004). The low level of PCB contamination in the settling pond is consistent with recent observations of PCB contamination in fish food (Meador, 2002; Schneider, 2004)."

The Hatchery has cleaned sediment from the pollution abatement pond and disposed of removed solids at a location on site. No effluent limitations are proposed for PCBs since there appears to be no potential this pollutant is present in the discharge at levels that threaten to cause or contribute to violations of water quality standards.

In the 2009 Wenatchee River TMDL (Ecology, 2009), Ecology listed PCBs based on three tissue samples in 1997 from anadromous or nonresident fish. There was no information on the likely source of the toxic pollutant as it relates to the waterbody segment. Since no evidence was available to connect the pollutant to this stream segment, Icicle Creek has been placed in the Waters of Concern Category for PCB. No wasteload allocation for PCB was developed for LNFH or any other point source. Because there was no evidence that PCB is in the effluent from LNFH, no effluent limit was developed for this parameter. Furthermore, EPA has determined that these **PCBs are not likely to adversely affect** listed species.

5.1.6 Microbiological Pollutants

The LNFH follows *The Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State 2006* (NWIFC and WDFW 2006). This policy includes a number of requirements to minimize the potential for pathogens in fish culture and minimize the transmission of pathogens from cultured salmonids to wild stocks. The requirements include surveillance for regulated viral pathogens, fish health monitoring, hatchery sanitation, transfer requirements, containment plans for pathogens of concern, and communication and reporting requirements.

To briefly summarize, the plan requires that the health of each stock reared at a co-manager's facility will be monitored monthly by a Fish Health Inspector until the fish are released. Fish deaths suspected to be due to pathogens are investigated by the Fish Health Inspector. When an infectious agent is detected, preventative and therapeutic strategies are implemented to reduce the impact of the pathogen. Water supplies containing fish are tested for viral pathogens once every three spawning cycles. Brood stock populations spawned at the facilities will be tested for viral pathogens annually. Eggs, as well as equipment used to transfer eggs, gametes or fish between fish management zones, will be sanitized before being used. Rearing units are cleaned regularly, and wastes are disposed of in a way to prevent discharge into State waters. Fish mortalities are removed and disposed of in a way to prevent discharges into State waters. The transfer of gametes, eggs, fish and carcasses for nutrient enhancement projects will be managed to prevent importation of exotic pathogens and spread and amplification of regulated endemic fish pathogens into the state waters. Facilities are required to have a management plan describing containment activities taken in the event that a pathogen resulting in biological loss is detected at the facility. In addition, fish health staff must be notified upon presumed or confirmed identification of a pathogen resulting in significant biological loss.

The transmission of pathogens from cultured salmonids to wild stocks via hatchery effluent, though certainly possible, has a low probability of actually occurring. Given the possibility that pathogens could be present in hatchery effluents, simple exposure to a pathogen is insufficient to cause disease (Stephen and Iwama 1997). According to Stephen and Iwama (1997), in order for a pathogen to affect a fish population the following must occur:

- The exposed population must be susceptible to the strain of pathogen presented;
- There must be exposure to sufficient concentrations of the pathogen that remains viable long enough to cause disease; and
- The dynamics of the population and pathogen must be such that the disease can be perpetuated to cause adverse effects.

According to Spence et al. (1996), disease organisms can be introduced to streams via hatchery effluent. However, Wallace (2002) investigated 21 salmonid hatcheries in Washington State, evaluating hatchery effluents for the presence of 15 salmonid pathogens, and concluded that cold-water hatcheries do not serve as a reservoir for indicator bacteria or salmonid pathogens. According to Brannon et al. (2004), there is little evidence to suggest that disease transmission to wild stocks of fish from intensive culture practices is routine and that the biological significance of aquatic animal pathogens in hatchery effluent is unknown.

Since the LNFH follows a very thorough fish disease policy to prevent the transmission of pathogens from cultured salmonids to wild stocks, microbiological pollutants will result in an insignificant or discountable effect on the listed fish species. Based on this information, EPA determined that microbiological pollutants are **not likely to adversely affect** any of the listed fish species

5.1.7 pH

There are no applicable technology-based effluent guidelines for pH from discharges from hatcheries; however, the criteria for pH in fresh waters from applicable State standards is 6.5 - 8.5, with no variation greater than 0.2 pH units attributable to discharges. The USEPA believes that receiving water pH will not be impacted by discharges from fish hatcheries, and therefore, no discharge limitation for pH is being proposed in this permit. Based on this information, it was determined that pH is **not likely to adversely affect** any of the listed fish species

5.1.8 Ammonia

Ammonia occurs naturally in water at low concentrations in equilibrium with other inorganic nitrogen compounds. Ammonia commonly enters the environment as a result of municipal, industrial, agricultural, and natural processes. Natural sources of ammonia include the decomposition or breakdown of organic waste matter, gas exchange with the atmosphere, forest fires, and nitrogen fixation processes. Point sources of ammonia include emissions and effluents from industrial plants, fertilizer plants and oil refineries (Environment Canada, 1997; CCREM, 1987). Elevated levels of it may be found in discharges from off-line settling basins at hatcheries. Non-point sources of ammonia include agricultural, residential, municipal, and atmospheric releases.

Ammonia is highly soluble in water and its speciation is affected by a wide variety of environmental parameters including pH, temperature, and ionic strength. In aqueous solutions, an equilibrium exists between un-ionized (NH_3) and ionized (NH_4 +) ammonia species. Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH_4 +) (Environment Canada, 1997; CCREM, 1987). Ammonia is toxic to fish and other aquatic life when it is in the un-ionized form. It is thought that the un-ionized form is more toxic because these neutral molecules may pass through biological membranes more readily.

Fish are adept at sensing and avoiding very low concentrations of ammonia. Furthermore, fish have been reported to enter waters that contain acutely toxic concentrations of ammonia without suffering any obvious long-term effects, as long as these excursions are followed by periods in which the fish are in waters that contain ammonia concentrations below acute toxicity levels (Thurston et al., 1981). Concentrations of ammonia acutely toxic to fishes may cause loss of equilibrium, hyper-excitability, increased breathing, cardiac output and oxygen uptake, and, in very high concentrations, convulsions, coma, and death. At lower concentrations ammonia has many effects on fishes, including a reduction in hatching success, reduction in growth rate and morphological development, and pathologic changes in tissues of gills, livers, and kidneys (USEPA, 1999). Factors that have been shown to affect ammonia toxicity include dissolved oxygen concentration, temperature, pH, previous acclimation to ammonia, fluctuating or intermittent exposures, carbon dioxide concentration, salinity, and the presence of other toxicants (USEPA 1999). Invertebrates are generally more tolerant than fishes to the acute and toxic effects of ammonia (USEPA, 1986). The following summary of toxicological test is from the Canadian Water Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment, 1999).

Studies conducted by Thurston et al (1984) found sensitivity to un-ionized ammonia (NH_3) concentrations ranged from 0.01 to 0.07 mg/L over a period of 5 years. No correlation between ammonia concentration and number of eggs produced was observed in the parental generation. Pathological lesions in the gills and extensive tissue degradation in the kidneys were directly correlated with ammonia concentrations above 0.04 mg/L, after 4 months of exposure. Sockeye salmon (O. nerka) were exposed to total ammonia for 62 day from fertilization to hatching (Rankin, 1979). Concentrations of un-ionized ammonia were calculated and ranged from 0.00097 - 4.92 mg NH3/L at 10°C and pH 8.2 and hatchability was the measured endpoint. Hatchability was 63.3%, 49% and 0% in controls, at 0.12 mg/L, and 0.46 mg/L, respectively. An EC_{20} was calculated for this study by Environment Canada (1999) with correction for control mortality. The reported EC_{20} was 0.057 mg/L un-ionized ammonia. Bader and Grizzle (1992) exposed catfish (Ictalurus punctatus) fry to ammonia in a 7-day static renewal test. An IC_{20} for fry growth was determined by Environment Canada (1999) at 0.162 mg/L un-ionized ammonia. There was no incremental mortality up to 0.490 mg/Lexposure. Smith et al. (1984) conducted a 30-day early life-stage test on bluegill sunfish (Lepomis macrochirus). The test exposed 28-day old embryos and monitored them to the swim-up fry life stage. No significant reduction was found in percent of hatch up to a concentration of 37 mg/L un-ionized ammonia. However, larvae were deformed and generally died within 6 days. An IC_{20} (survival and growth) of 0.060 mg/L was calculated (Environment Canada, 1998) for this study.

The permit requires monitoring of the discharge from the pollution abatement pond (off-line settling basin) for ammonia, pH, and temperature. According to the Technical Development Document for the CAAP category, most of the nitrogen from these facilities is in the form of ammonia, which is not usually found at toxic levels in CAAP discharges (EPA, 2004). EPA believes that the discharge from LNFH will not include enough ammonia to be toxic. Based on this information, EPA determined that ammonia is **not likely to adversely affect** any of the listed fish species.

5.2. FISH

A number of water quality parameters that could be affected by hatchery facilities were analyzed for effects on aquatic species in Section 5.1. While existing or future facilities are located adjacent to or near surface waters used as habitat by listed fish species, it is believed that the proposed permit will not result in adverse effects to the water quality of such waters. Therefore, the effects determination for listed fish species is:

> **May affect, but is not likely to adversely affect** Chinook salmon (Upper Columbia River Spring Run), steelhead (Upper Columbia), or bull trout (Columbia River Basin).

5.3. BIRDS

The avian species addressed in this BE include the Northern spotted owl and the marbled murrelet. These birds occur in a variety of habitats throughout Washington. As discussed in Section 3, some of the avian species under consideration in this BE, such as the marbled murrelet, have specialized habitat needs, with habitats located in remote areas outside the action area covered in this permit. Other species have limited populations within the state, most of which are located outside of the action area. Thus, the effects determination for the avian species under consideration is:

No effect on the Northern spotted owl or the marbled murrelet.

5.4. TERRESTRIAL MAMMALS

The terrestrial mammals included in this biological evaluation are the grizzly bear, the Canada lynx, and the gray wolf. These species habitat is located on land and, with the exception of the grizzly bear, their food consists mostly of vegetation or other terrestrial mammals. As discussed in Section 3.1, these species have specialized habitat preferences which are located outside of the action area. These species should have no exposure to waters impacted from LNFH. Therefore, the effects determination for these species is:

No effect on the grizzly bear, the Canada lynx, or the gray wolf.

5.5 PLANTS

The plants included in this biological evaluation are Ute Ladies'-tresses, Showy stickseed, and the Wenatchee Mountains checker-mallow. The habitat for these species is located on land and either miles upstream different drainages (Showy stickseed and Ute Ladies'-tresses) or above the elevation of the hatchery in the same drainage (Wenatchee Mountains checker-mallow). As such, these species have specialized habitat preferences which are located outside of the action area. These species should have no exposure to waters impacted from these facilities. Therefore, the effects determination for these species is:

No effect on Ute Ladies'-tresses, Showy stickseed, or Wenatchee Mountains checker-mallow.

5.6 CUMULATIVE EFFECTS AND INTERDEPENDENT/INTERRELATED ACTIONS

5.6.1 Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions on endangered or threatened species or critical habitat that are reasonably certain to occur in the action area considered in this biological evaluation. Future federal actions or actions on federal lands that are not related to the proposed action are not considered in this section.

Future anticipated nonfederal actions that may occur in or near surface waters in the State of Washington include timber harvest, grazing, mining, agriculture, urban development, municipal and industrial wastewater discharges, road building, sand and gravel operations, introduction of nonnative fishes, off-road vehicle use, fishing, hiking, and camping. These nonfederal actions are likely to continue having adverse effects on the endangered and threatened species and their habitat.

There are also nonfederal actions likely to occur in or near surface waters in the State of Washington that are likely to have beneficial effects on the endangered and threatened species. These include implementation of riparian improvement measures, best management practices associated with timber harvest, grazing, agricultural activities, urban development, road building and abandonment, recreational activities, and other nonpoint source pollution controls.

5.6.2 Interdependent/Interrelated Actions

Interdependent actions are defined as actions with no independent use apart from the proposed action. Interrelated actions include those that are part of a larger action and depend on the larger action for justification. There are no known interdependent or interrelated actions for the NPDES permit for LNFH.

5.7 SUMMARY OF EFFECTS DETERMINATIONS

Effects determinations for the listed and candidate species discussed in this BE are summarized in Table 5-2. *(see notes on following page)*

Table 5-2 Summary of Effects Determinations

Species	Effects Determinations		
	NE[dd]	NLAA[ee]	LAA[ff]
Fish			
Chinook Salmon -- Upper Columbia River Spring Run ESU		X	
Steelhead -- Upper Columbia River ESU		X	
Bull Trout – Columbia River Basin DPS		X	
Birds			
Northern Spotted Owl	X		
Marbled Murrelet	X		
Terrestrial Mammals			
Grizzly Bear	X		
Canada Lynx	X		
Gray Wolf	X		
Plants			
Showy stickseed	X		
Ute Ladies'-tresses	X		
Wenatchee Mountains checker-mallow	X		

[dd] NE = No effect
[ee] NLAA = May affect, but is not likely to adversely affect
[ff] LAA = May affect, likely to adversely affect

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APPENDIX A

National Pollutant Discharge Elimination System (NPDES) Permit for Leavenworth National Fish Hatchery (Permit No.: WA-000190-2)